ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

MARCH, 1951

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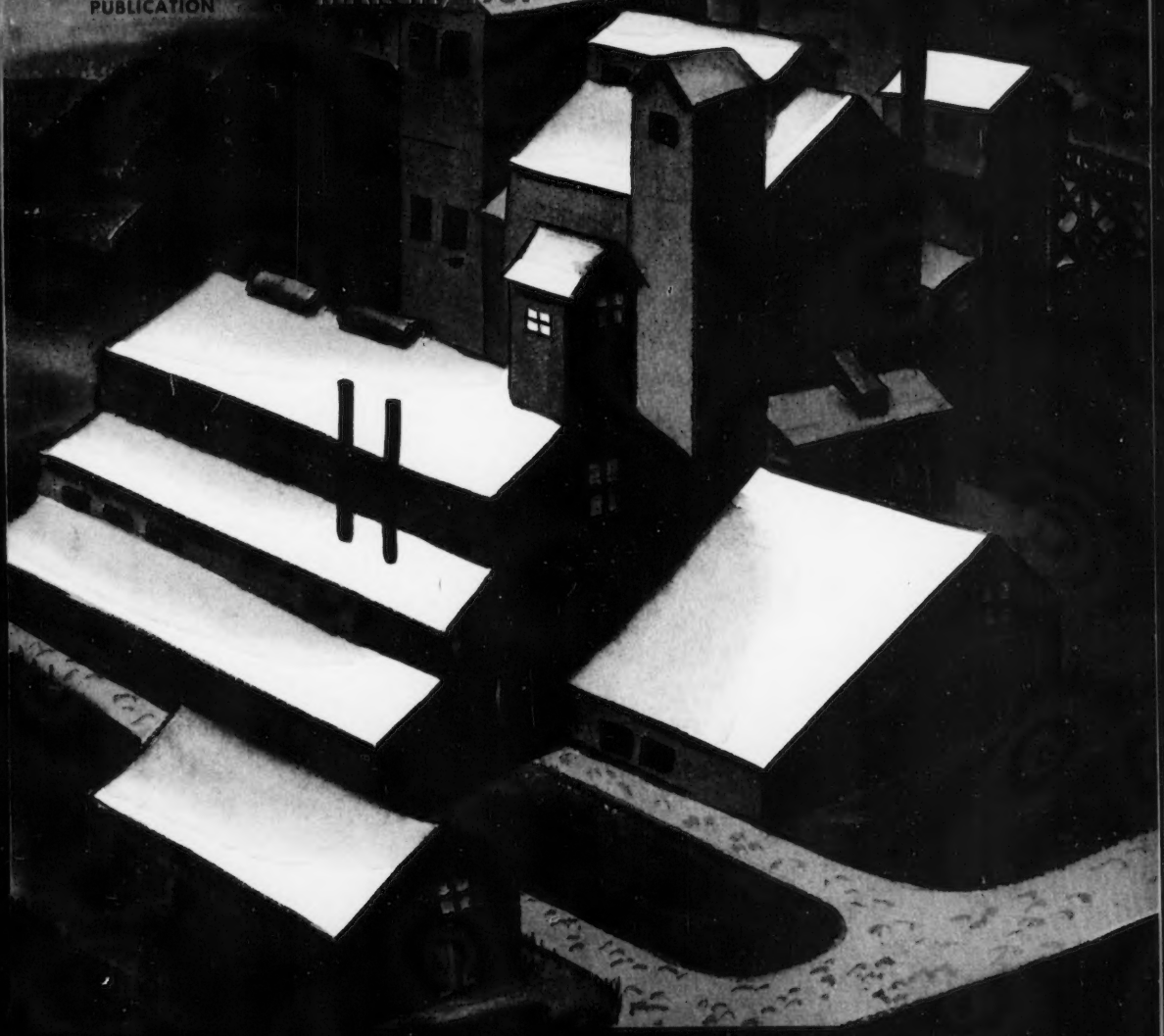
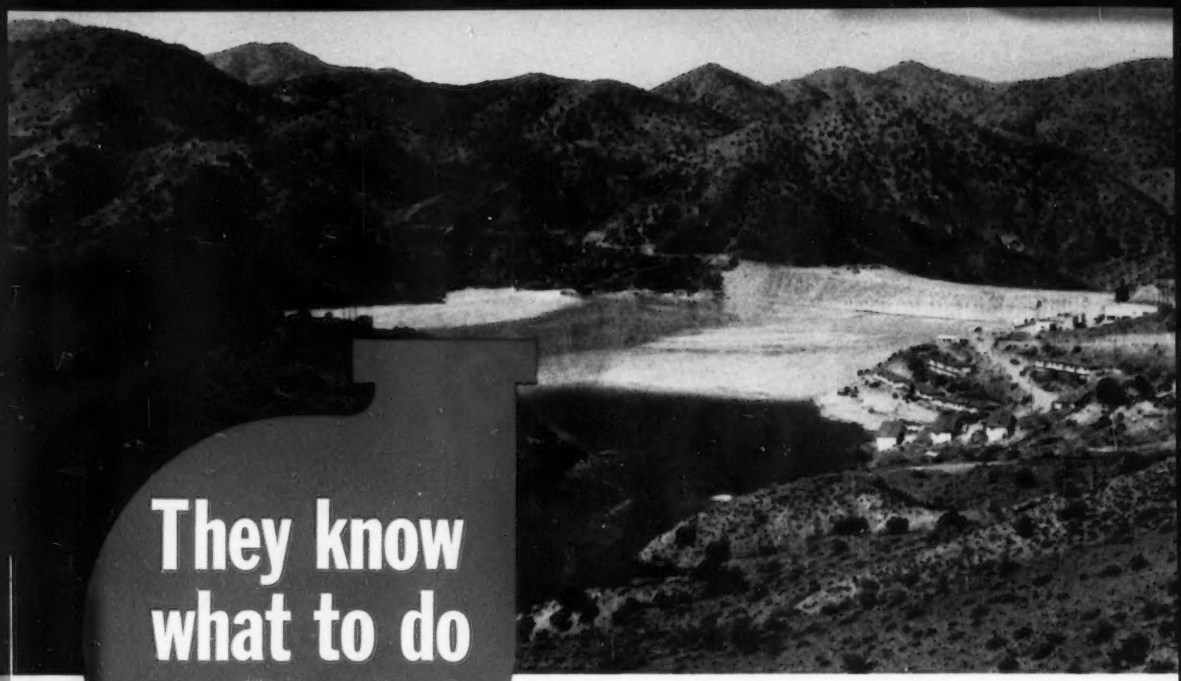


UTAH'S NEW URANIUM MILL

For latest developments on recovering uranium from carnotite ores, turn to page 56

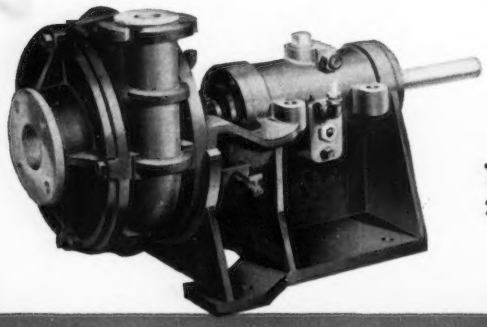


They know what to do at Bagdad

The 100-acre tailing pond at Bagdad, Arizona

When it comes to efficient tailings disposal, the mill engineers at the Bagdad Copper Corp. really know the answers. Every detail of the operation at their newly-enlarged flotation mill has been carefully planned to give maximum flexibility with low cost. Among the outstanding features of this model system is the pair of Hydroseal Pumps (one acting as standby) that handle the tailings from the mill to the pictured headbox.

Here's how their job stacks up: The pumps daily handle 4,000 tons of abrasives, consisting mostly of quartz and feldspar (sp. gr. 2.65). The pulp (33% solids by weight) is pumped over a ridge to the tailing pond through a 10-inch pipeline 484 feet long. The static head overcome is 51 feet. Since the installation in June, 1950, more than half a million tons of tailings have been handled by the pumps, and they are still going strong. In similar jobs, many Hydroseals have pumped over a million tons without replacement parts.



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Ingersoll-Rand Class HMTA pumps feature a simplified, high-strength, horizontally-split casing, and a unique *unit-type rotor assembly*. The multiple volute passages between stages are contained in precision-machined channel rings—assembled on the rotor shaft and locked in position within the smooth, symmetrical bore of the casing. The rotor-assembly elements are all self-aligning—all precision machined to fit together as a unit.

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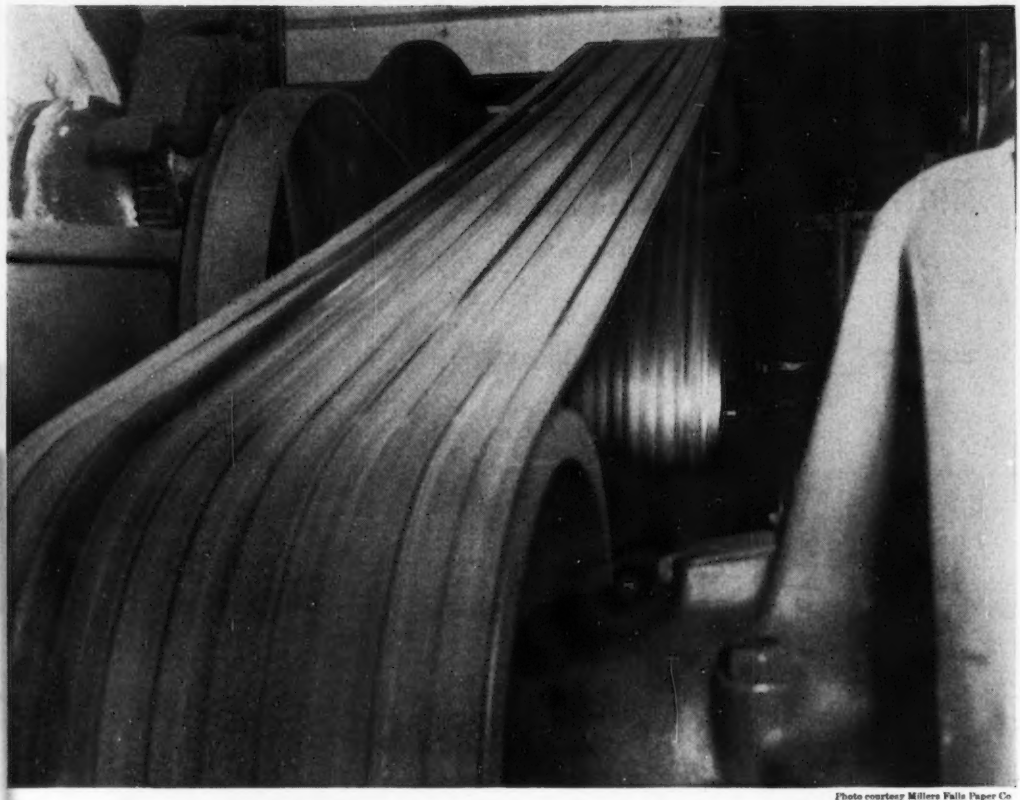

Photo courtesy Millers Falls Paper Co

Where B. F. Goodrich grommet belts lasted 8½ years

B. F. Goodrich grommet V belts cut costs 20 to 50%

GROMMET V belts (made only by B. F. Goodrich) handled a transmission job on this drive 24 hours a day for 8½ years. The service is rough—starting causes shock loads, pulsations. The drive is fully equipped with B. F. Goodrich grommet V belts—here's where that extra strength and longer life come from:

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RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

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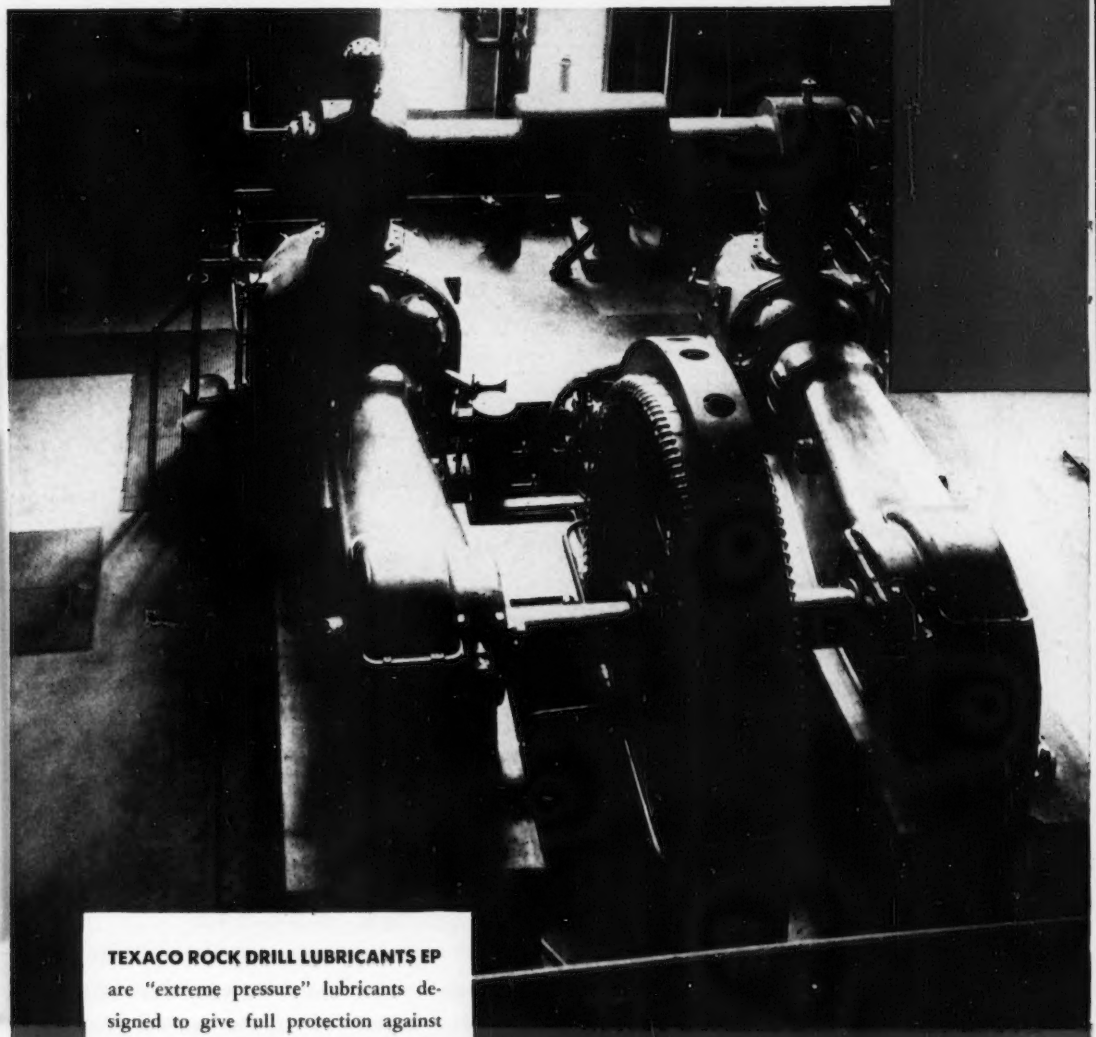

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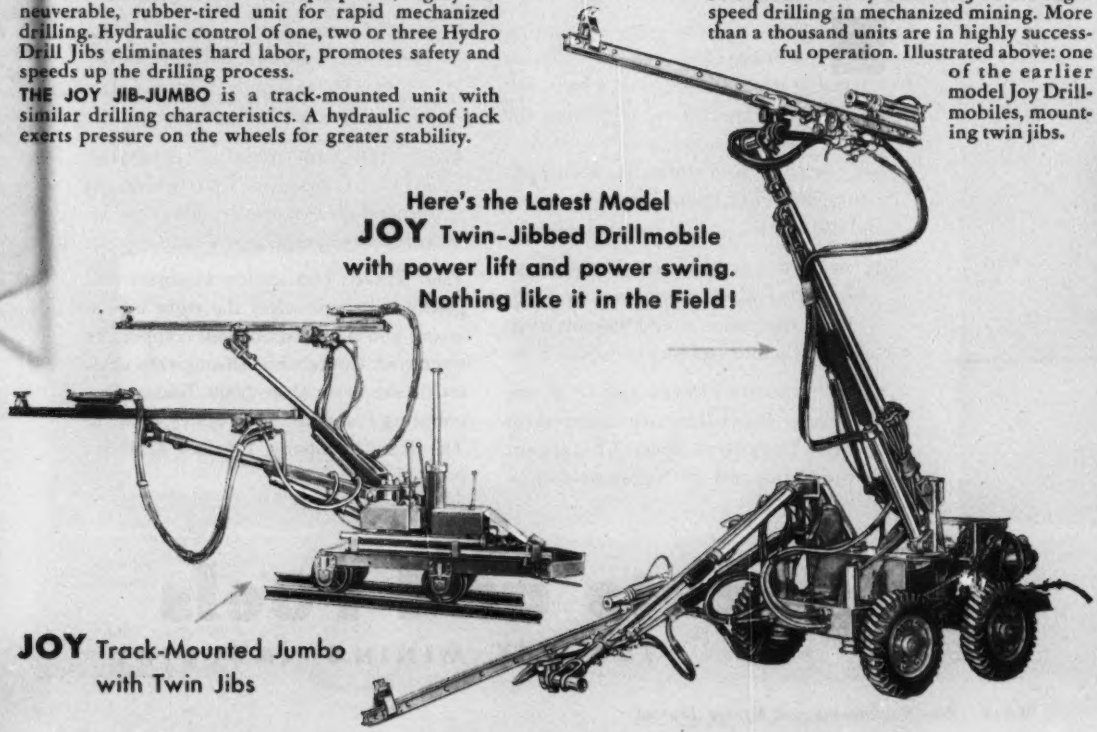

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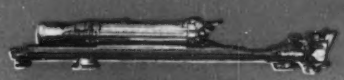

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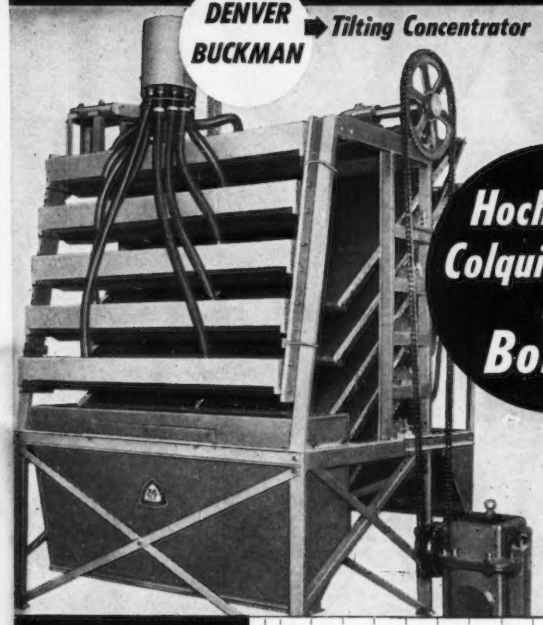

Hochschild Colquiri Plant in Bolivia

recovers 15 tons per month at a cost of only 7c per ton milled

(Quoted from November 1950 Mining Engineering)

"The tests reported in this paper indicated a tin recovery of 42 pct. The actual plant results for 1949 show a 54 pct. tin recovery from the Sullivan (Denver-Buckman) decks.

"The total average quantity of tin produced from the S deck section in 1949 was 15 tons of tin per month. This corresponds to 3 pct. of the total mill recovery.

"The operation of the whole slime plant in Colquiri including flotation and fine sand tailing, cost $0.07 per ton milled.

"In the year 1949 only $317.00 was spent for spare parts and material for the Sullivan decks in Colquiri with a total of 268,600 tons milled."

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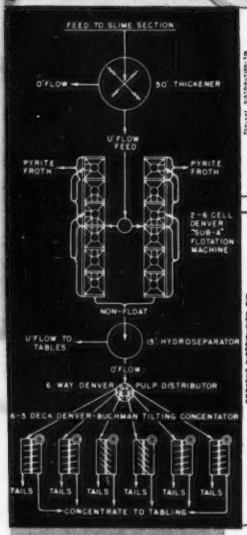
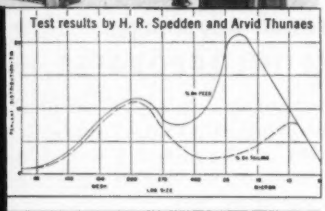
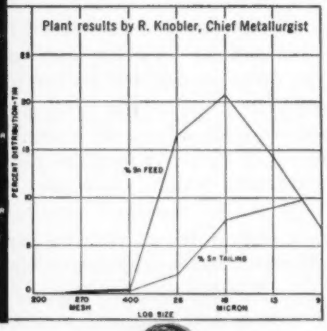
Denver-Buckman Concentrators are available in half sizes for laboratory pilot plant work, or the testing can be done by Denver Equipment Company Ore Testing Division on a cost basis.







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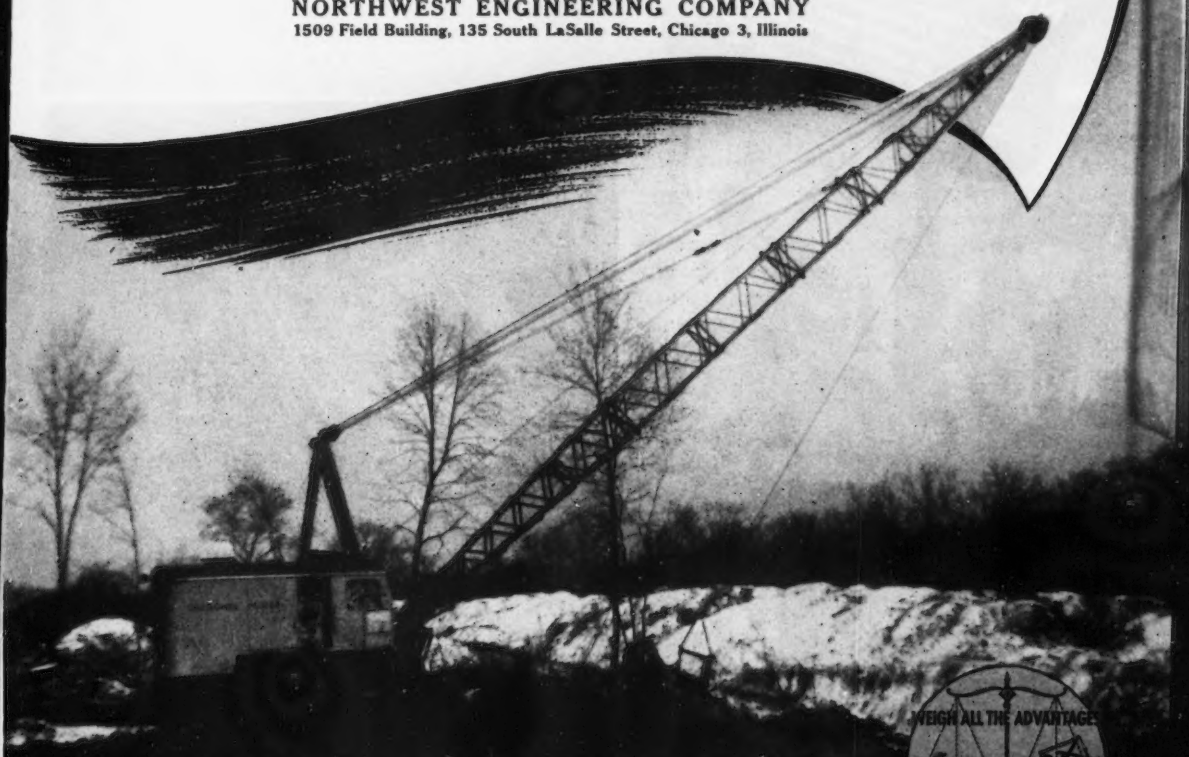

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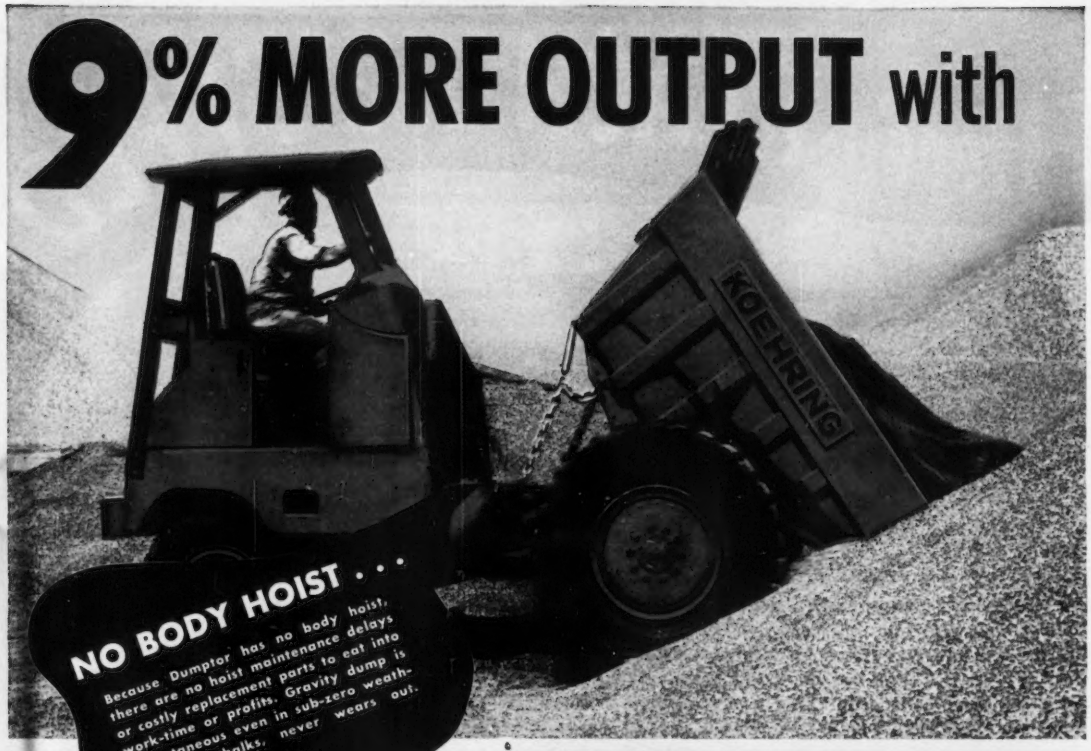

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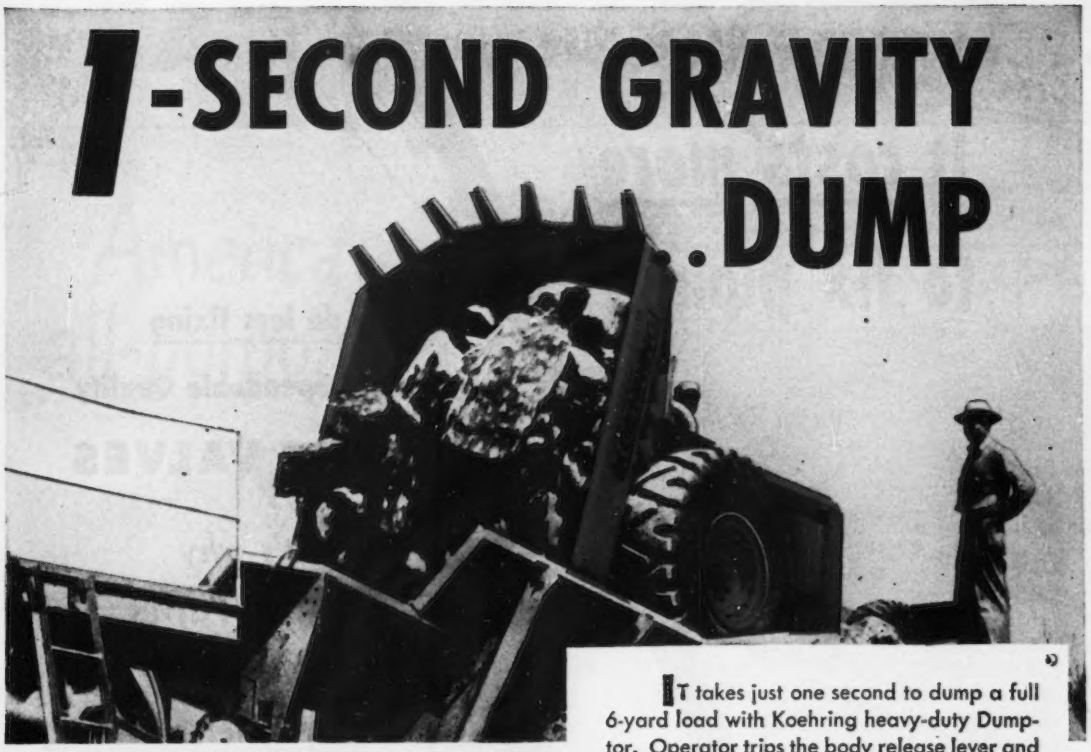
1-SECOND GRAVITY DUMP



IT takes just one second to dump a full 6-yard load with Koehring heavy-duty Dumptor. Operator trips the body release lever and gravity instantly tilts the scoop-shaped body 70° . . . one second later the body is empty, and Dumptor is on its way back for another load. Because there's no waiting for slow-acting body hoists, Dumptor saves 15 to 25 seconds every dump. This adds up to important gains in yardage output. At 16 trips per hour on a 1,000' haul, 20 seconds dumping time saved on every cycle gains 5.3 minutes more productive haul-time . . . adds 9% to hourly yardage output.

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"CAT" BULLDOZER...

America's all-purpose tool!

Working at a molybdenum mine near Climax, Colorado, which produces most of the world's molybdenum, these "Cat" D7s with No. 7S 'Dozers are feeding ore into hole leading to mine tunnel. They also operate dragline in the mine tunnel. Their ability to slug into a job and finish it on schedule is particularly important here, for molybdenum is used to strengthen steel and to produce alloys important to national defense. Price of a standard "Caterpillar" D7 Tractor is $11,010; No. 7S Bulldozer, $1,535; No. 25 Cable Control, $1,630, f.o.b. Peoria. Prices subject to change without notice.

THESE "Caterpillar" D7 Tractors with matching No. 7S blades are 'dozing molybdenum in a mine near Climax, Colorado. Their tough 'dozers take a constant beating from rocky abrasives; but their record has made owner Robert Ryan of Lakewood, Colorado, one of the best "Caterpillar" boosters in the Rockies.

These machines give you blade and tractor *built* to work together. This rugged team is a bear at meeting work schedules. Sturdy construction and quality materials enable it to keep punching full time without time out for tinkering, and the special steel cutting edge of the blade hammers through the toughest going. Most important of all, the precision methods used in "Caterpillar" factories build extra years of life into these highly maneuverable bulldozers.

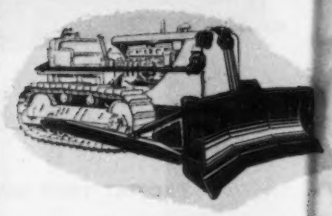
For help with your equipment problems, see your "Caterpillar" dealer *now*. Today's expanding military program has high priority. But it is recognized that our national preparedness depends upon stepped-up civilian production too. So your "Caterpillar" dealer is especially interested in meeting your needs—through equipment replacement and by exercising his working partnership with you to keep the machinery you have *on the job*.

CATERPILLAR, PEORIA, ILLINOIS

• • •

"CATERPILLAR" BULLDOZER EXTRA FEATURES

1. Tractor and 'dozer *broken to harness*, and a size for every need.
2. Moldboard curvature for active, *rolling*, higher production loads.
3. Box section side arms—extra thick at points of greatest stress.
4. Choice of straight or angling type of blade, simple to maneuver and easy to adjust or detach.
5. Your choice of hydraulic or cable controls.
6. The power of the "Caterpillar" Diesel Engine is geared to blade *capacity*.



New Addition to 'Dozer Line

Here's a specialist that can step up production and cut costs. It's the brand new No. 8U 'Dozer for use with the "Caterpillar" D8 Tractor with cable control. Working best in loose or light material, the end portions of the blade extend forward, giving it a flat U shape. This enables it to drift large loads without spillage, making it possible to bulldoze longer distances for bigger production. The No. 8U is built to the same high standards of strength and long life as the other "Caterpillar" Bulldozers. The versatility of this new tool gives it excellent performance on all kinds of 'dozing jobs, from stockpiling to pioneering.

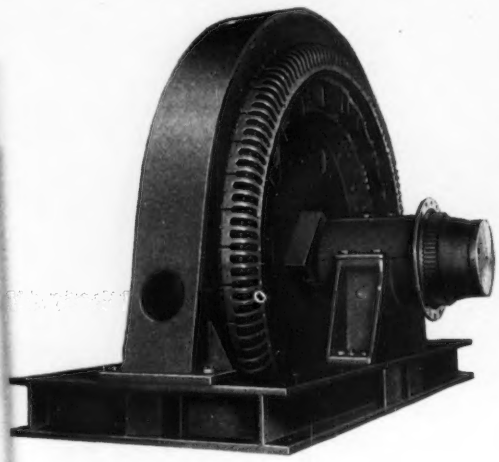
CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

Save on original costs

use G-E synchronous

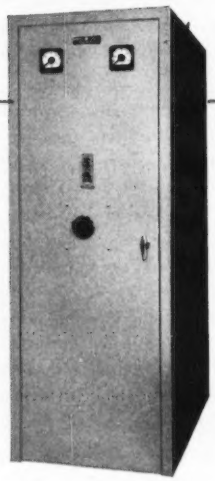


You'll save money in many applications when you specify General Electric synchronous motors. The chart shows (ratings above the black line) the applications where synchronous motors (including control and exciter) have a lower first cost than any other kind of motor. And even in cases where there is no original saving (between red and black lines) you can save on over-all cost by specifying synchronous motors to increase operating efficiency and improve power factor.

When you specify G-E synchronous motors, you get application engineering by experts in the electrical problems of *your* industry. You get the motor that gives you greatest return on your investment.

For your next large, constant-speed motor, ask your General Electric sales representative to tell you how you can take full advantage of the money-saving features of G-E synchronous motors. Or write for bulletins on your letterhead to *Section 770-17, Apparatus Dept., General Electric Co., Schenectady 5, N.Y.*

Low speed..GEA-5332 **High speed..GEA-5426**
Control..GEC-505



PROTECT YOUR SAVINGS WITH G-E SYNCHRONOUS MOTOR CONTROL

New rotor field circuit provides accurate field application—motor is protected against starting shock.

New rotor field circuit keeps constant check on motor performance and, on pull-out, field is removed before first slip cycle is completed—to protect against electrical and mechanical damage.

In addition to the protection offered by the new rotor field circuit, the **new, smaller air-break Limitamp controller** provides fast-acting EJ-2 Fuses that limit short circuits to less than one-half cycle for motors up to 5000 volts.

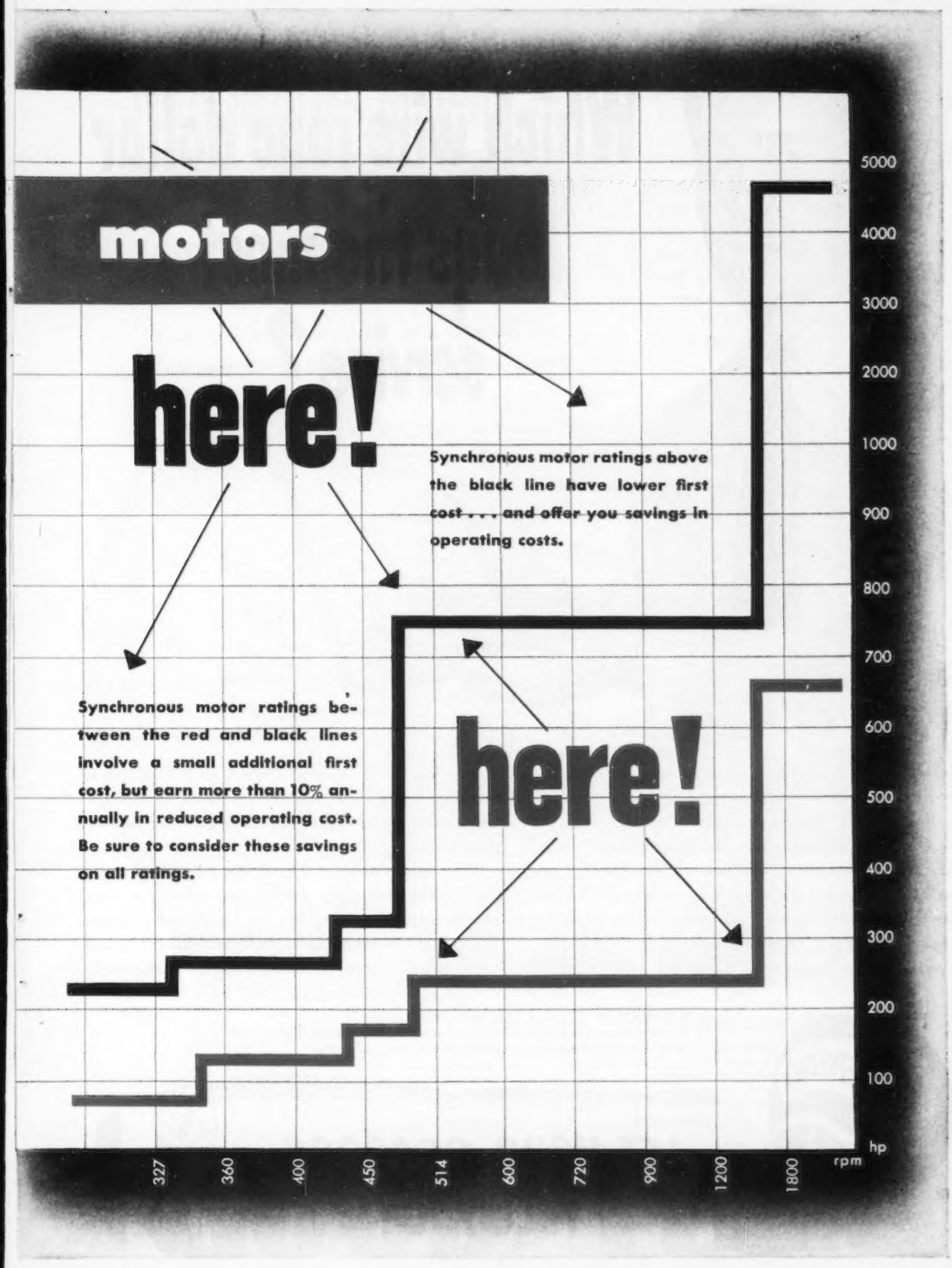
Low-voltage motors (up to 600 volts) are protected by compact, easily inspected air-circuit breakers.

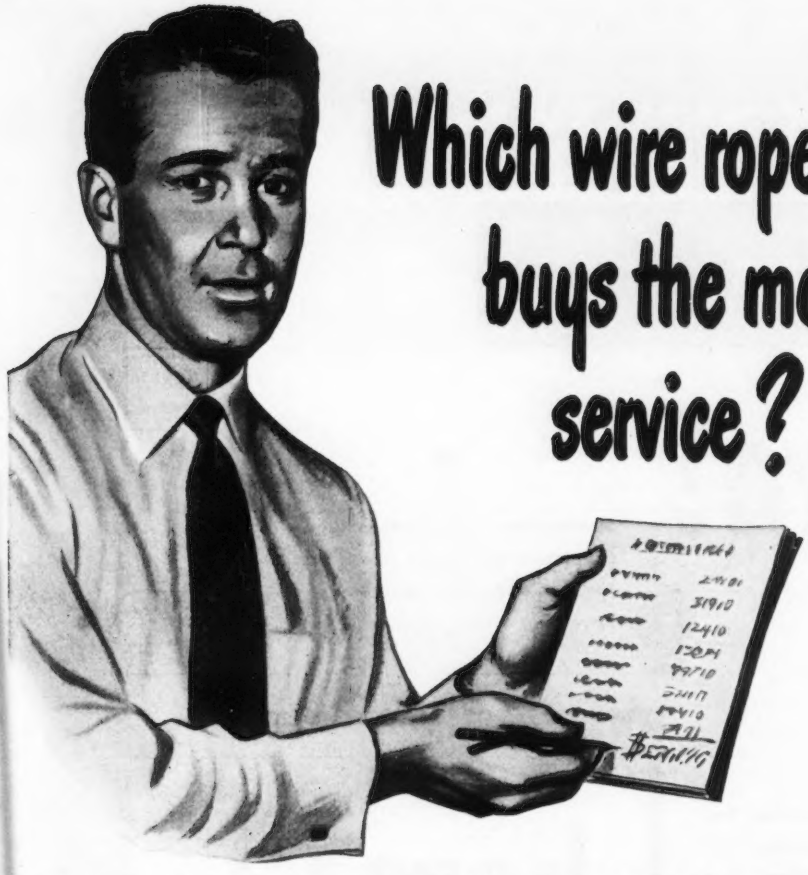
To make it easier to install, to adjust, to operate, and to service, G-E synchronous control is factory-mounted in a steel enclosure with anti-glare meters and all the built-in accessories required for your application.

Come to General Electric for the engineering and manufacturing that will assure you of adequate protection of your motor and plant investment. Write for more information on this precise motor control.

GENERAL ELECTRIC

770-17


motors
here!
Synchronous motor ratings above the black line have lower first cost . . . and offer you savings in operating costs.
Synchronous motor ratings between the red and black lines involve a small additional first cost, but earn more than 10% annually in reduced operating cost. Be sure to consider these savings on all ratings.
here!
5000
4000
3000
2000
1000
900
800
700
600
500
400
300
200
100
hp
327
360
400
450
514
600
720
900
1200
1800
rpm



Which wire rope dollar buys the most service?

Isn't it true that when you purchase wire rope, you're actually buying service? Buying what the wire rope will do for you? Buying units of work?

The rope dollar that buys the most units of work has been wisely spent. Can you tell which brand of rope is giving you the most for your money? There are many users who can—by keeping records of wire-rope performance. They know what constitutes good, average service in terms of ton-miles, yards of rock moved, etc. When a certain brand gives better-than-average service over a period of years, they know they're getting a big return on the dollars spent for that brand.

Their figures prove it. That's why Bethlehem urges the keeping of records—records that show rope costs per unit of work. For we feel that in any such comparisons, Bethlehem rope will stand out from the crowd . . . in a way that will please the user's pocketbook.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

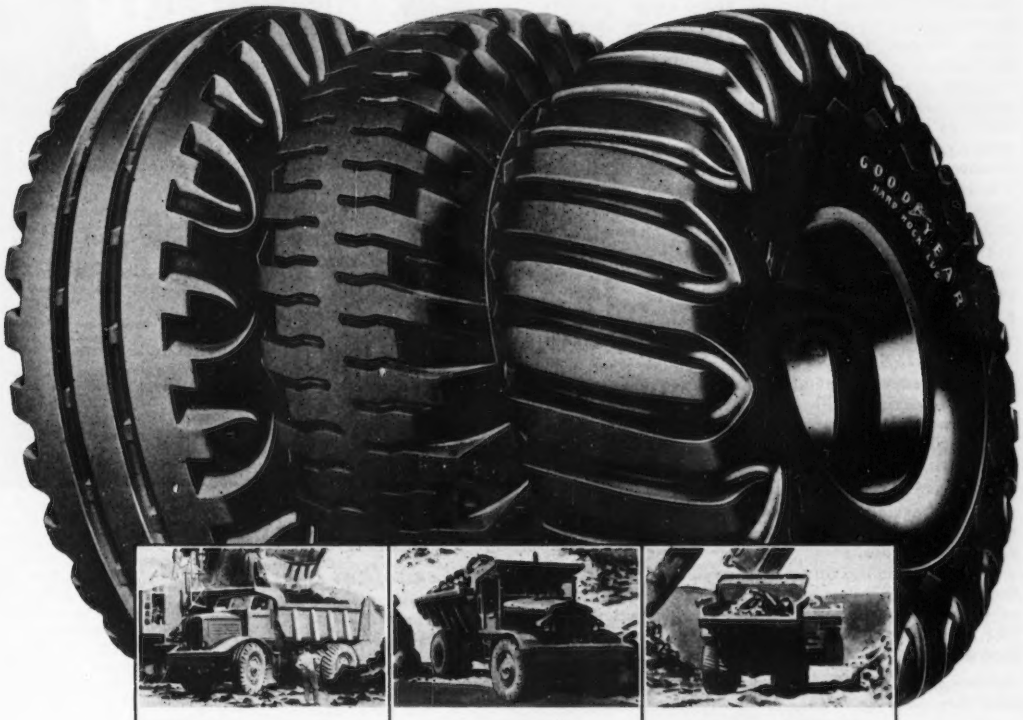
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

LET YOUR RECORDS TELL YOU!

Your profits depend on * CPY

That's why more tons are hauled on Goodyear tires than on any other kind!

* **Cost per yard** determines your profits. Cost-conscious pit and quarry operators depend on Goodyear tires for *lowest* cost per yard. That's because each Goodyear tire is designed to give maximum performance on a particular type of hauling job. Choose the right Goodyear work tire for your job and see how *your* cost per yard is reduced — learn why Goodyear tires are America's First Choice. *It pays to BUY and SPECIFY Goodyear!*



THE HARD ROCK RIB

Companion tire for front wheels in rock work—easier steering, smooth rolling, same cord body, same shoulder and sidewall as Hard Rock Lug.

THE ROAD LUG

Remarkable dual-purpose tire operates both OFF and ON the road. Combines off-the-road toughness and traction with on-the-road mileage and economy.

THE HARD ROCK LUG

Super-tough champ for all types of rock work. Its armored carcass and extra heavy lugs assure more wear, better performance even in toughest going.

GOODYEAR

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

Read ing—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Farval pays for itself quickly, many times over

...saving oiling labor
...saving lubricant
...saving bearing expense
...saving production time

WITH Farval you lubricate your machinery or equipment mechanically. Farval does the job quickly and dependably.

Any type of bearing surface, enclosed or open, can be Farval-lubricated with grease or oil. Measured charges of lubricant are metered to each bearing through the unique Dualine Valve, delivered under pressure from a central reservoir, either by a manually operated pump or one actuated by an automatic time-clock mechanism.

Farval is not a new idea. It has proved its value in service over a 23-year period, protecting millions of bearings in every phase of industry—in manufacturing plants, mining and quarrying operations, transportation—wherever there are bearings that have to be lubricated. Thousands of installations on mills, presses, conveyors, cranes, engines and other industrial equipment provide records of money saved. Savings take four forms:

1. Labor saving—Farval eliminates hand oilers. Minimum attention only is required—to inspect system, refill lubricant reservoirs, etc.

2. Lubricant saving—Correct amounts are used without waste, frequently reducing oil or grease consumption as much as 75%.

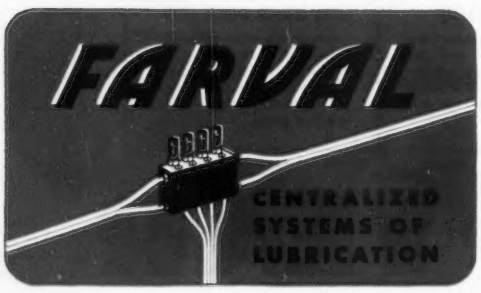
3. Bearing expense saving—No more burned out or damaged bearings with Farval protection. Expense of replacement eliminated.

4. Production time saving—Farval lubricates while equipment is running. No shutting down to oil. No taking a machine out of production to repair or replace bearings.

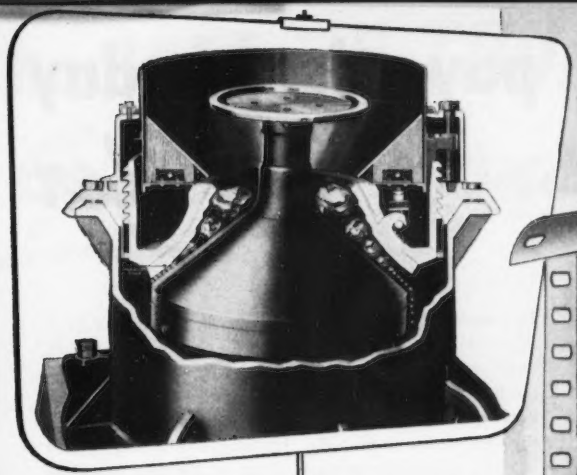
In short, savings are so positive that you soon recover the entire cost of a Farval system—and savings continue as extra dividends.

If you want figures on savings possible with Farval on the types of machines you operate, just write us. Tell us what equipment you have and ask for Bulletin 25. The Farval Corporation, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



FARVAL—*Studies in Centralized Lubrication*
No. 122



"The SYMONS PROCESS of CRUSHING"

as revealed by the camera

'Tis said that "the proof of the pudding is in the eating." The proof in a Crusher, however, is in its ability to continually produce large quantities of desired product economically. That such has been proven by the SYMONS CONE CRUSHER is evidenced by the thousands of Standard and Short Head SYMONS CONES which have been installed throughout the world wherever fine reduction crushing is being done.

The enormous capacity of the SYMONS CONE CRUSHER is made possible by the remarkably simple SYMONS PROCESS OF CRUSHING which is revealed in the accompanying views through the camera's eye. To record the film, a Standard type CONE CRUSHER was sectionalized to expose the crushing cavity.

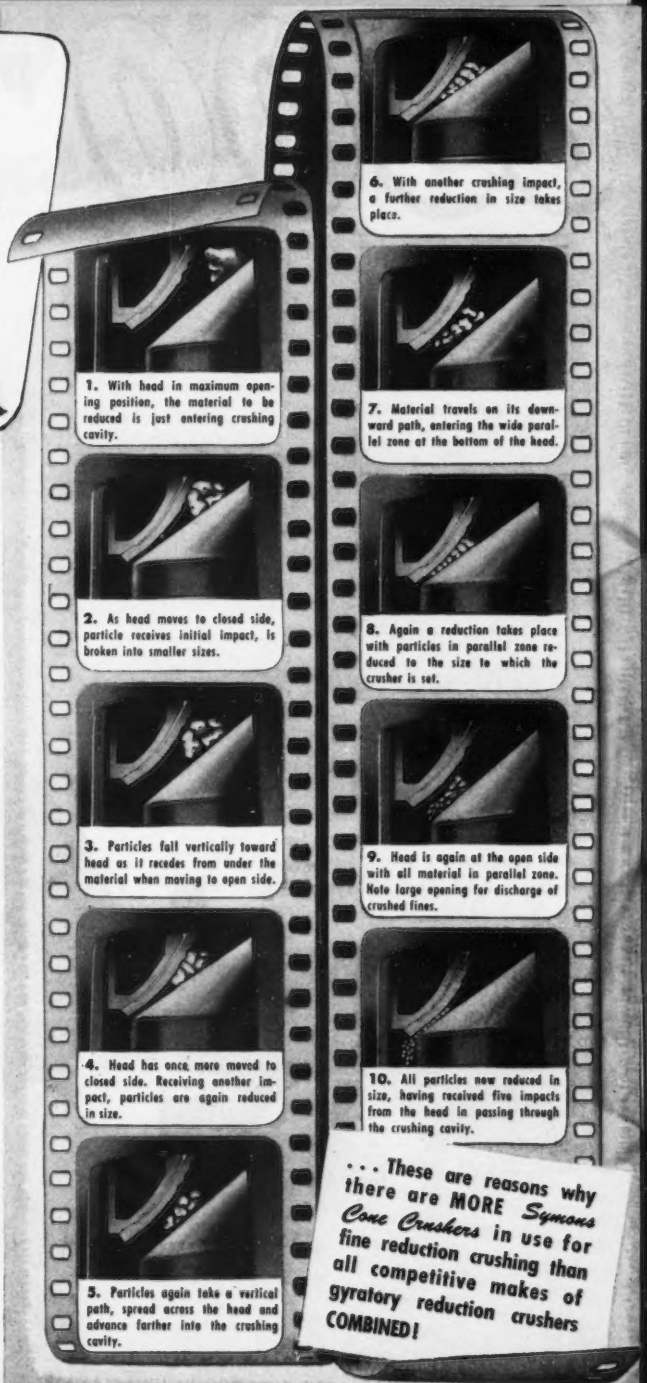
Although the SYMONS CONE is classified as of the "gyratory" type, the principle of crushing differs radically from that of the conventional gyratory since the head or cone in the SYMONS CRUSHER travels at least five times as far and gyrates much faster than in the ordinary gyratory type of crusher.

The material, in its passage through the crushing cavity in the SYMONS CONE, is controlled and timed to receive a series of rapid hammer-like blows before it is discharged.

The crushing action in the SYMONS CONE is a combination of controlled feed, high speed, timing, and extraordinarily large discharge capacity. These factors, coupled with the spring release safety feature of being able to pass uncrushable items—such as tramp iron, etc.—constitute ample proof of the superiority of the SYMONS CONE and the SYMONS PROCESS OF CRUSHING.

The camera reveals that from the time the material enters the crushing cavity until it is discharged, it passes through a successive series of crushing stages with a minimum of abrasion, sliding, or frictional wear—the entire process being one of smashing impact, resulting in maximum reduction.

C151


1. With head in maximum opening position, the material to be reduced is just entering crushing cavity.
2. As head moves to closed side, particle receives initial impact, is broken into smaller sizes.
3. Particles fall vertically toward head as it recedes from under the material when moving to open side.
4. Head has once more moved to closed side. Receiving another impact, particles are again reduced in size.
5. Particles again take a vertical path, spread across the head and advance farther into the crushing cavity.
6. With another crushing impact, a further reduction in size takes place.
7. Material travels on its downward path, entering the wide parallel zone at the bottom of the head.
8. Again a reduction takes place with particles in parallel zone reduced to the size to which the crusher is set.
9. Head is again at the open side with all material in parallel zone. Note large opening for discharge of crushed fines.
10. All particles now reduced in size, having received five impacts from the head in passing through the crushing cavity.

. . . These are reasons why there are MORE *Symons Cone Crushers* in use for fine reduction crushing than all competitive makes of gyratory reduction crushers COMBINED!

NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN
NEW YORK • SAN FRANCISCO • WASHINGTON • SPOKANE
MEXICO, D. F. • LONDON • TORONTO • JOHANNESBURG

NORDBERG

Machinery for processing ores and industrial minerals

6500 pay yds. per day for

On the Columbia River near Bridgeport, Washington, General Construction Company of Seattle is excavating a 4,000,000-yd. intake channel for the powerhouse at Chief Joseph Dam. Project calls for digging approximately 2,500,000 cubic yds. of granite and rock and 1,500,000 yds. of silt-sand from a bend in the river . . . then using the material to relocate a riverside highway. Most of the heavy hauling is being handled by a Le Tourneau fleet of 9 electric-control dirt-movers . . . including 5 rear-dump C Tournarockers and 4 C Tournapulls. Contractor's records show that on hauls ranging from 200 to 4000′ one-way, the 5 Tournarockers alone are averaging 812.5 yds. an hour . . . 6500 pay yds. of rock and sand per day.

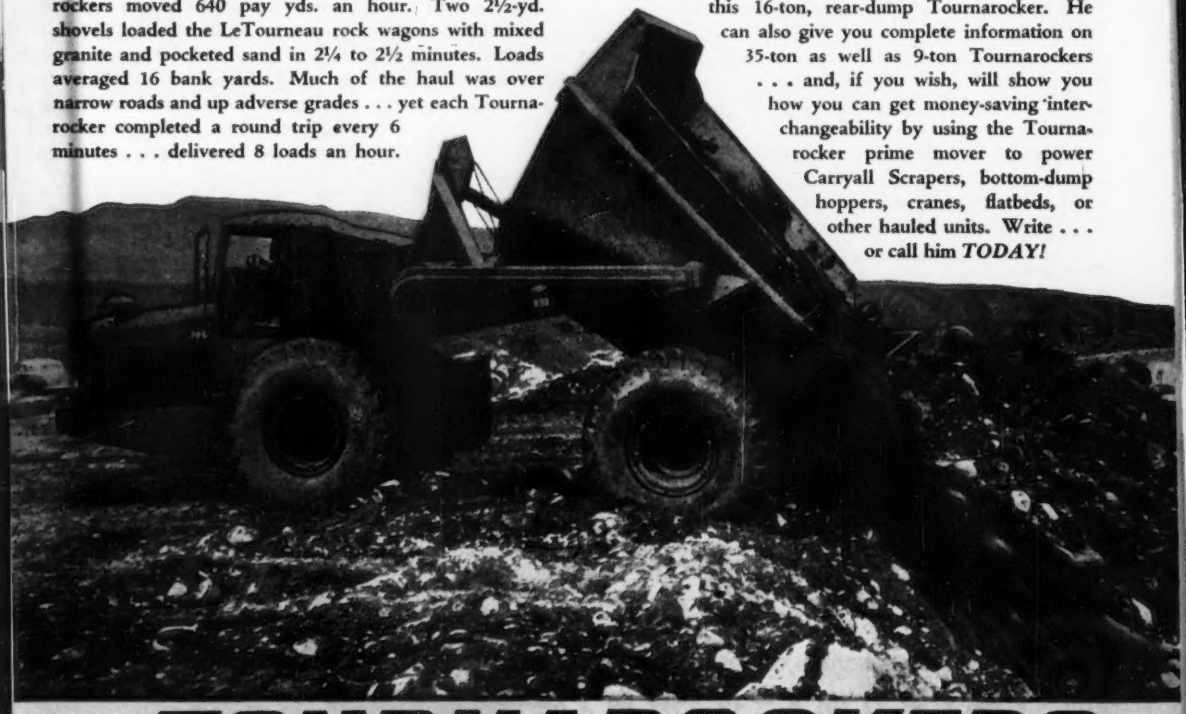
2200′ cycle every 6 minutes

On a typical 2200′ cycle, for example, the 5 Tournarockers moved 640 pay yds. an hour. Two 2½-yd. shovels loaded the LeTourneau rock wagons with mixed granite and pocketed sand in 2¼ to 2½ minutes. Loads averaged 16 bank yards. Much of the haul was over narrow roads and up adverse grades . . . yet each Tournarocker completed a round trip every 6 minutes . . . delivered 8 loads an hour.

Fast cycles like these are possible because Tournarocker's short 90° turns and positive fingertip electric steer permit quick spotting both at shovel and at dump. Heavy-duty. multi-disc air brakes on all 4 wheels (4176 sq. in. total braking surface) give operators complete driving safety throughout the haul cycle. Holding action of powerful brakes . . . plus front-wheel drive on big tires of prime mover . . . let Tournarockers dump safely over steep banks. Simple electric hoist tilts body to vertical position . . . streamlined bowl clears loads instantly.

Offer important savings for you

These same Tournarocker advantages which are helping General Construction Company speed Chief Joseph Dam construction offer new low-hauling costs on your jobs, too. Ask your LeTourneau Distributor about this 16-ton, rear-dump Tournarocker. He can also give you complete information on 35-ton as well as 9-ton Tournarockers . . . and, if you wish, will show you how you can get money-saving interchangeability by using the Tournarocker prime mover to power Carryall Scrapers, bottom-dump hoppers, cranes, flatbeds, or other hauled units. Write . . . or call him *TODAY!*



LETOURNEAU LET EQUIPMENT

TOURNAROCKERS

FOR LOWEST NET COST PER YARD

hauled by 5 TOURNAROCKERS

General Construction Co.

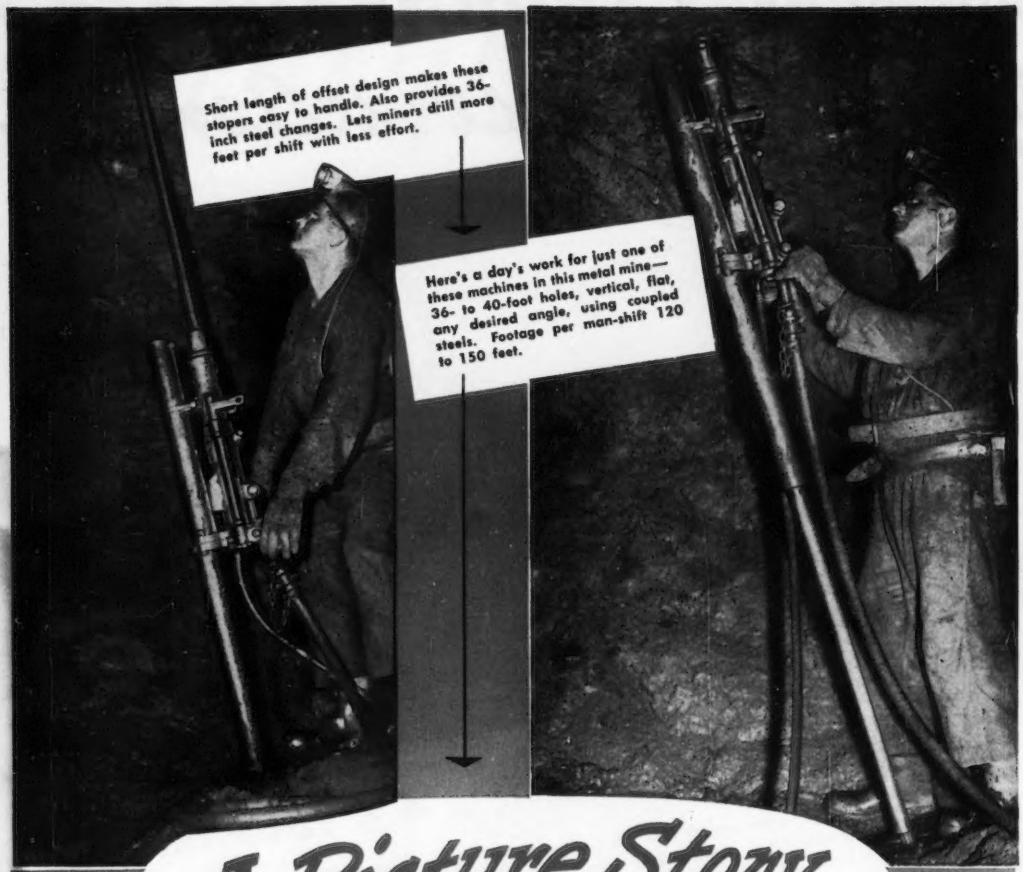
2000 pay yds. per day moved by 4 C TOURNAPULLS

While 5 Tournarockers were setting high production records on this Columbia River job, General Construction Company's 4 high-speed, electric-control C Tournapulls were moving dirt at an equally fast pace on another section of the project. Using a 144 h.p. pusher to load over 70′ distances, each Tournapull heaped 10 pay yds. of moist silt-sand and gravel in 50 seconds . . . highballed 1300′ to dump . . . spread over 60′ in 20 to 25 seconds. Each Tournapull completed the 2600′ cycle over extreme grades and rough, winding haul roads in 6 minutes . . . made 8.3 trips an hour . . . delivered 84 pay yds. That's 332 yds. hourly for the 4 Tournapulls . . . and checks with contractor's production records which show that on hauls ranging from 1000 to 4000′ one-way, the 4 rubber-tired Le Tourneau rigs are averaging 250 cubic yds. an hour . . . 2000 yds. per 8-hour shift.

Tournarocker—Trademark Tournapull Compatible—Trademark Reg. U.S. Pat. Off. C134

TOURNAPULLS

R. G. LeTOURNEAU, Inc., Peoria, Illinois


Short length of offset design makes these stopers easy to handle. Also provides 36-inch steel changes. Lets miners drill more feet per shift with less effort.
Here's a day's work for just one of these machines in this metal mine—36- to 40-foot holes, vertical, flat, any desired angle, using coupled steels. Footage per man-shift 120 to 150 feet.

A Picture Story of Lower Stoping Costs

. . . shows how Le Roi-CLEVELAND offset stopers drill extra footage, save you money

Take a good look at these pictures. Note the length of the drill steel. Fitted with carbide-tipped bits, it gives you 36" of drilling—3 feet with every change.

That's one of the reasons why Le Roi-CLEVELAND offset stopers are paying off in lower drilling costs.

But it's not the whole story. The machines shown here are equipped with downstroke rotation. This gives plenty of power and lets the miners drill holes from 36 to 40 feet in depth — using coupled steel. Total footage drilled per man-shift runs from 120 to 150 feet.

Performance like this does a lot to keep costs down. It also accounts for the growing popularity of Le Roi-CLEVELAND offset stopers wherever stoping is a problem.

Other features of these machines are: Removable water tube — no need to dismantle the machine. Graduated feeding pressure. Constant blowing at chuck keeps machine clean. Write us today for complete details.

LE ROI COMPANY

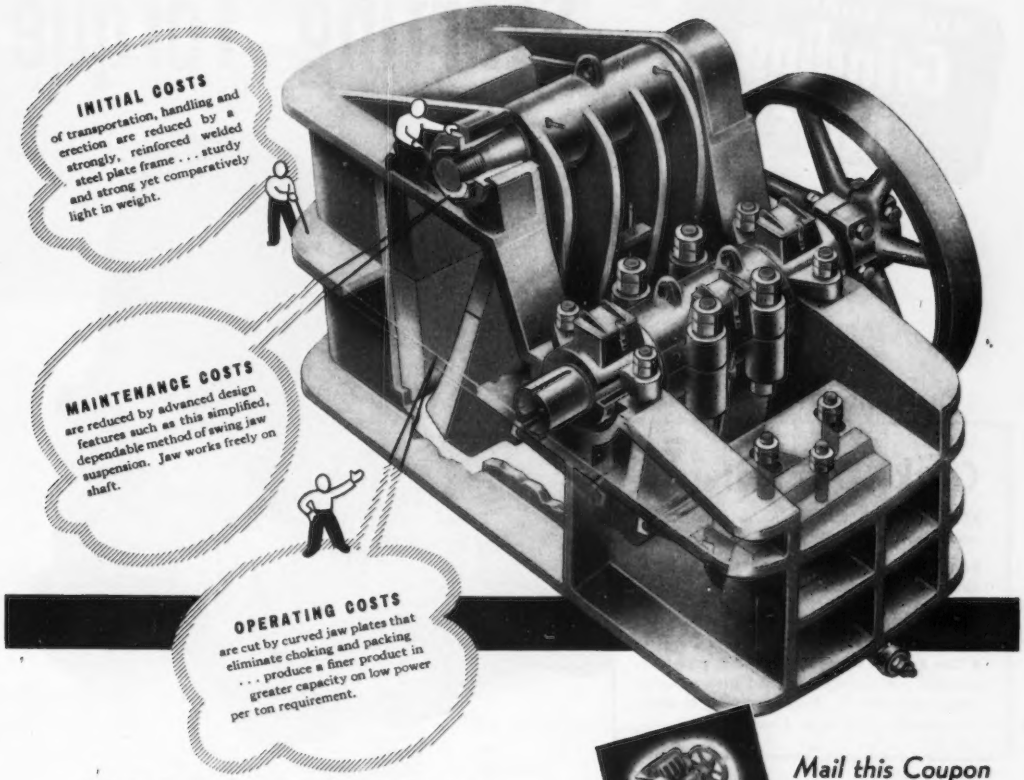
RD-33

CLEVELAND ROCK DRILL DIVISION

12500 Berea Road, Cleveland 11, Ohio

Plants: Milwaukee, Cleveland and Greenwich, Ohio

á Traylor H Jaw Crusher starts cutting Costs the day you buy it



INITIAL COSTS of transportation, handling and erection are reduced by a strongly, reinforced welded steel plate frame . . . sturdy and strong yet comparatively light in weight.

MAINTENANCE COSTS are reduced by advanced design features such as this simplified, dependable method of swing jaw suspension. Jaw works freely on shaft.

OPERATING COSTS are cut by curved jaw plates that eliminate choking and packing . . . produce a finer product in greater capacity on low power per ton requirement.

Traylor Type H Jaw Crushers are heavy-duty, modern machines that boast of many advanced design features to increase plant efficiency and lower production costs. They are the answer for any producer who needs a primary breaker to produce a uniform, cubical product . . . with a minimum of waste fines and maintenance expense. Mail the coupon for free bulletin that gives complete details on Traylor Type H Jaw Crusher . . . the primary crusher that starts cutting costs the day you buy it.

Mail this Coupon for Complete information

TRAYLOR ENGINEERING & MANUFACTURING CO.
324 MILL ST., ALLENTOWN, PA.

I want to start cutting costs with a Traylor H Jaw Crusher.

*Name*_____

*Company*_____

*Address*_____

SALES OFFICES: New York, N.Y.; Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd. Montreal, P.Q.

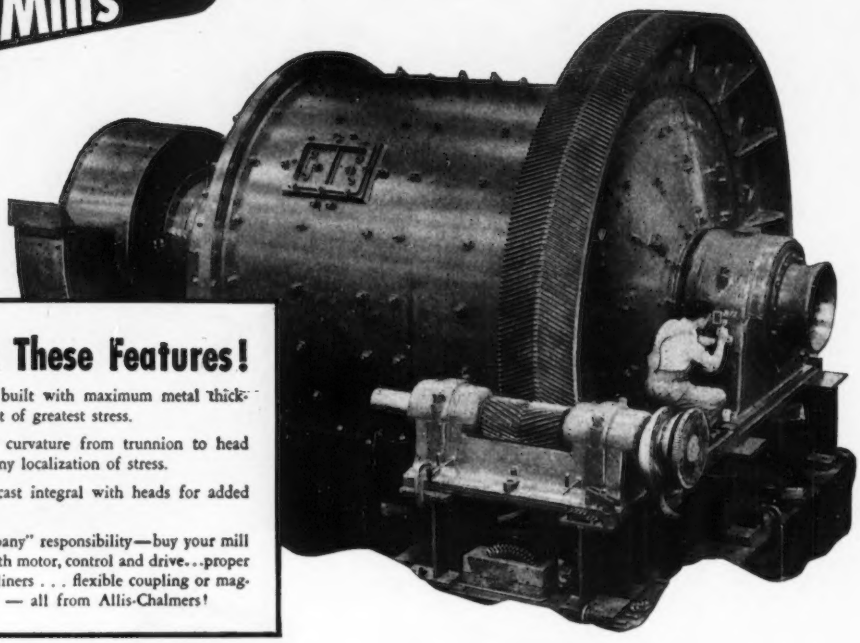
A "TRAYLOR" LEADS TO GREATER PROFITS

Traylor

Rotary Kilns, Coolers and Dryers · Grinding Mills
Jaw, Reduction and Gyratory Crushers · Crushing Rolls

Overcome Problem of High Starting Torque

ALLIS-CHALMERS **Grinding Mills**



Check These Features!

- Trunnions built with maximum metal thickness at point of greatest stress.
- A gradual curvature from trunnion to head eliminates any localization of stress.
- Trunnion cast integral with heads for added strength.
- "One company" responsibility—buy your mill complete with motor, control and drive...proper feeder and liners . . . flexible coupling or magnetic clutch — all from Allis-Chalmers!

TRUNNION BEARINGS on all the larger sizes of Allis-Chalmers grinding mills are supplied with an individual high pressure lubricating pump to provide lubricant between mill trunnion and bearing during initial starting, insuring minimum starting torque and bearing wear.

Hand operated bearing lubricating pump.

Floating the mill in this way results in much less punishment to vital parts. Reduced starting torque gives you less strain on gear teeth and less torsional strain on the pinionshaft.

REDUCES DOWNTIME

Protection from excessive wear and strain in starting your mill will prove to be immensely important in terms of less costly maintenance and less idle mill time. Another reason it pays to specify A-C mills!

Allis-Chalmers builds a complete line of grinding mills: ball and rod mills; pebble mills, Compeb and Ballpeb mills. The A-C representative in your area can be a big help in working out grinding problems. Call him today, or write: A-3044

ALLIS-CHALMERS, 969A SO. 70 ST. MILWAUKEE, WIS.

Compeb, Ballpeb and *Texrope* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Motors

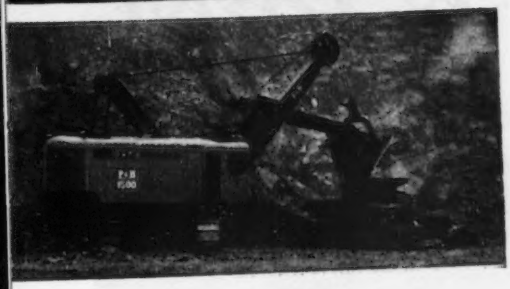
Controls

Texrope Drives

Vibrating Screens

Crushers

Kilns, Coolers, Dryers



triple play for profit

with P&H ELECTRIC SHOVELS

All three of these P&H Electric Shovels are at work for J. Robert Bazely at Pottsville, Pa. There are three sizes at work here — 4, 5 and 6 cu. yds., all delivering steadily at rock bottom costs.

P&H leads the field in Electric Shovel Developments.

It's the same pattern wherever these new P&H Electric Shovels go to work: The first machine sells the second — the third — and more.

The reasons are plain and simple — *better performance — bigger production — lower tonnage cost.*

Reasons behind the reasons are such advantages as P&H Magnetorque* which powers hoisting motions electro-magnetically — smoother, faster, more dependably . . . rugged all-welded construction with more strength to withstand shock loads . . . independent propel for quicker move-ups . . . stepless control which eliminates all contactor troubles . . . filtered air cab ventilation for less electrical down time.

The cold, hard facts that count are: *performance, production, low tonnage cost.* Figure your costs with P&H Electric Shovels and you'll find a convincing difference. It explains why every third P&H Electric Shovel sold is a repeat order.

*T. M. of Harnischfeger Corporation for electro-magnetic type clutch.

P&H ELECTRIC SHOVELS
4454 West National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

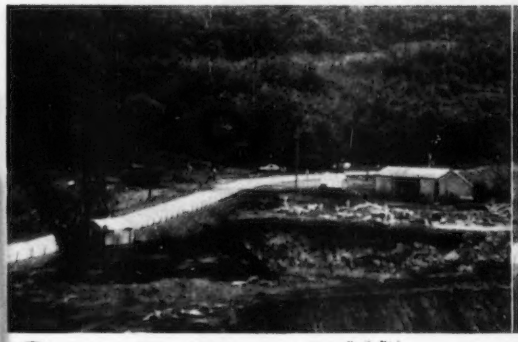
Every third P&H Electric Shovel sold is a repeat order

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • PRE-ASSEMBLED HOMES

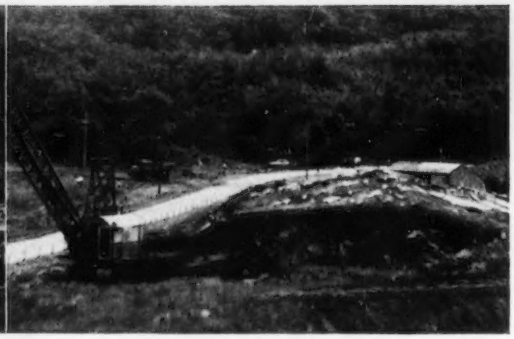
Watch this Blast

Machine-gun camera takes a photo every ⅛ second—shows what really *happens when a blast is shot.*

No wasted explosives gas



① *21 vertical holes, 9,700 pounds of dynamite ready to go.*



② *⅛ second later. See the rock "swell" at first instant of blast . . . but no sign of escaping gas.*

THIS was a typical ROCKMASTER blast by Fauzio Brothers at the Lehigh Navigation Coal Company's Nesquehoning, Pennsylvania stripping operation. Holes were 40 feet deep, with 18-foot spacing, 19-foot burden. The blast was initiated from the bottom of each hole, with ROCKMASTER Nos. 1, 2, 3, and 4 milli-second electric blasting caps.

Whether your job calls for blasting rock, coal, ore, ROCKMASTER blasting means true *controlled force . . . controlled throw . . . controlled breakage.* Write today for your copy of the ROCKMASTER booklet showing how you can profit through the use of the correct numbers of the *sixteen* ROCKMASTER milli-second delay electric blasting caps teamed with the ROCKMASTER system of explosives choice and loading methods. Our technicians will be glad to assist you in applying ROCKMASTER to your operation.

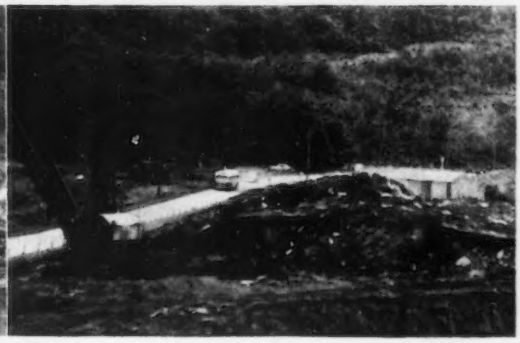
GO!

...No wild rock...even at the peak of the blast!

③ *⅛ second after Photo. No. 2. Rock going up... gases still confined where they do most work.*

④ *High point of the blast! Explosives gas has done maximum work.*

⑤ *As rock begins to fall, first traces of spent gases and smoke seep through broken rock. Burden completely shaken.*



⑥ *Rock ready for the shovel. Only three minutes after traffic was stopped it's on its way again.*

Rockmaster—Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES

"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Bagdad Copper Corporation's Arizona plant chose Gates Vulco Rope Drives for these big Ball Mills because of the proven ability of Gates Vulco-Ropes to handle this rugged service.

This Simple Test Tells WHY the Concave Sides of Gates Vulco Ropes Mean *Longer Belt Life!*

Prove this *yourself*—in two minutes' time.

Take any V-belt that has *straight* sides. *Bend* that V-belt while you grip its sides between your fingers and your thumb. You will *feel* the sides of the belt *bulge out*—as shown in figure 1-A, below.

Clearly, that outbulge forces the sides of the belt to press *unevenly* against the V-pulley—and this concentrates the *wear* where the bulge is greatest.

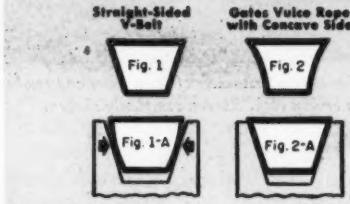
Now, make the same test with the belt that is built with the Concave Sides—the Gates Vulco Rope.

Figures 2 and 2-A show clearly what happens when you bend a Vulco Rope. Instead of *bulging*, the precisely engineered Concave Sides merely *fill out* and become perfectly straight. There is no side-bulge. This belt, when bent, precisely fits its sheave groove.

Because there is *no bulging*, the sides of the Gates Vulco Rope always grip the *full* face of the V-pulley *evenly* and therefore wear *uniformly*—resulting in *longer belt life* and *lower belt costs for you.*

Only V-belts made by Gates are built with concave sides. Whenever you buy V-belts, be sure that you get the V-belt with the Concave Sides—The Gates Vulco Rope!

What Happens When a V-Belt Bends



How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill Out to a Precise Fit in the Sheave-Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

CS-511

THE GATES RUBBER COMPANY
DENVER, U. S. A.
The World's Largest Makers of V-Belts

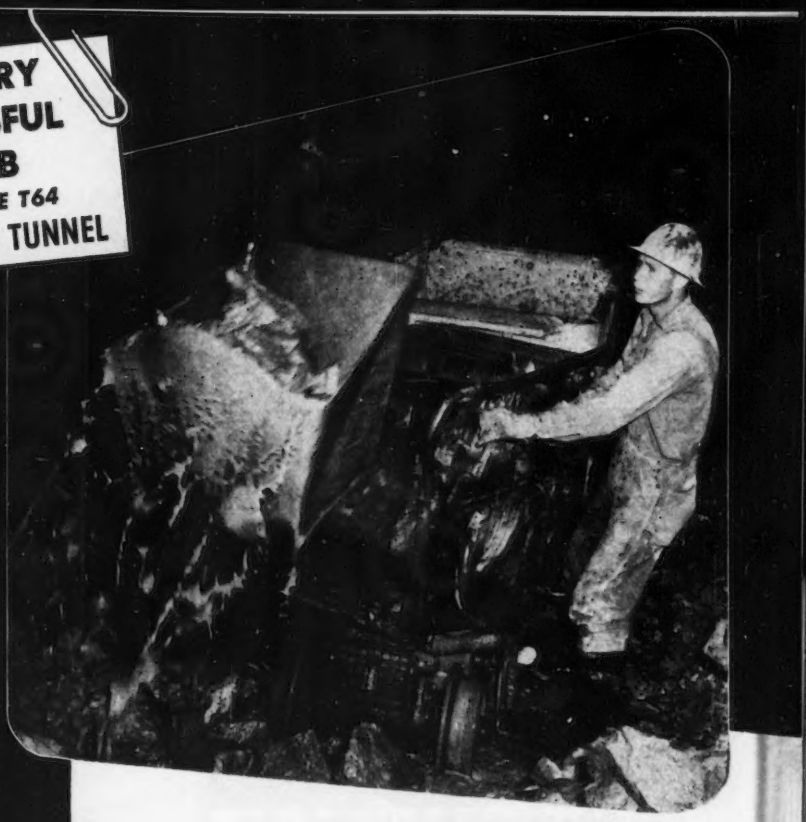
Gates VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

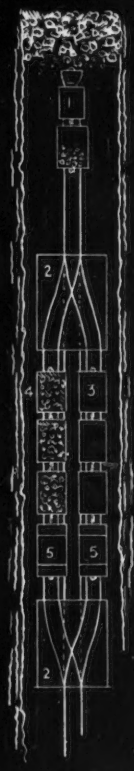
CASE HISTORY OF A SUCCESSFUL TUNNEL JOB

FROM THE EIMCO FILE T64

CONTINENTAL DIVIDE TUNNEL

The Continental Divide Tunnel (also known as the Alva B. Adams Tunnel) was driven on contract by three different contractors all using Eimco equipment for loading. Total length 13.3 miles, no intermediate openings. Longest contract 42,995 ft. Avg. advance per month for 37 months on longest contract — 1144'.





Interesting facts about this tunnel include: 1,800,000 man hours of labor were required to excavate the 310,000 yards of material, 480 miles of drill holes were required and 1,240 tons of powder were used.

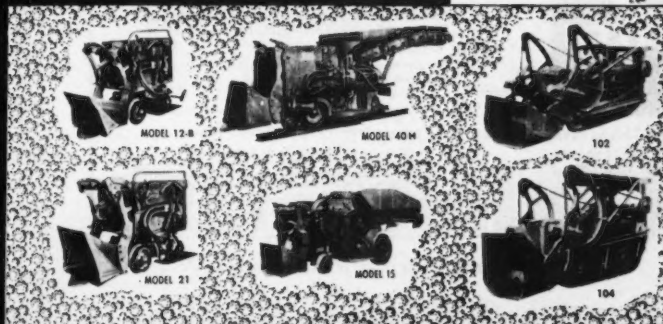
For switching cars at the heading a double track passing switch was built to slide along on top of the permanent track. See illustration at left: 1. Eimco Model 21 Loader. 2. Double track switch mounted on plate to slide on permanent track. 3. Empty cars. 4. Loaded cars. 5. Locomotive.

Successful tunneling is dependent on arriving at a satisfactory cycle of drilling, blasting and mucking, then repeating the cycle as fast and as often as possible.

Contractors who have been most successful in working out this formula have been most emphatic in saying that dependable equipment means most in maintaning the pace that pays dividends.

Eimco equipment for loading is dependable. "It's meant the difference between success and failure on our job," says one superintendent.

There's an Eimco Rocker Shovel for every size tunnel and for speed, economy and dependability you can't beat an Eimco.



EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

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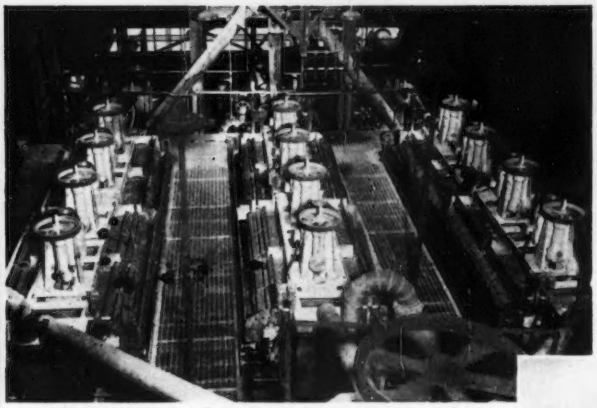
ANOTHER CASE OF RESULTS WITH FAGERGREN FLOTATION MACHINES!



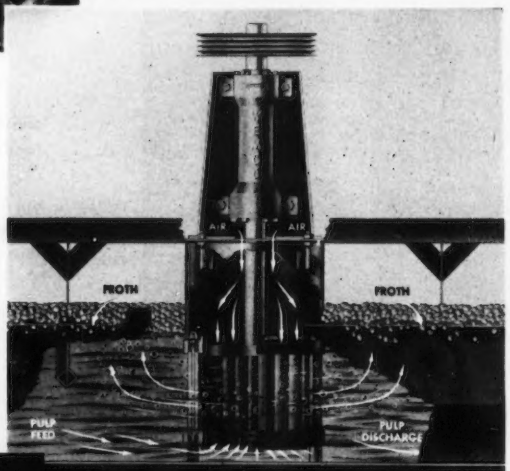
Typical Fagergren installation at American Cyanamid Co. Sydney mine at Brewster, Florida, floating phosphates.

- Zinc concentrate grade up from 57% to 60%.
- Rougher tailings reduced from 2.5% to 0.6% zinc.
- Horsepower and reagent consumption lowered.

Typical of many installations where Fagergrens are used as both roughers and cleaners, these outstanding results were recently reported by a prominent zinc producer. A conversion from another make machine to Fagergrens provided convincing proof of Fagergren superiority in roughing and cleaning.

HIGH METALLURGICAL EFFICIENCY is a direct result of the thorough dispersion of air achieved by the Fagergren rotor-stator design, which together with simple, rugged construction brings these important advantages to operators throughout the world:

- High mineral recovery.
- Minimum reagent consumption.
- Low power consumption.
- High capacity per foot of cell volume.
- Minimum maintenance expense.



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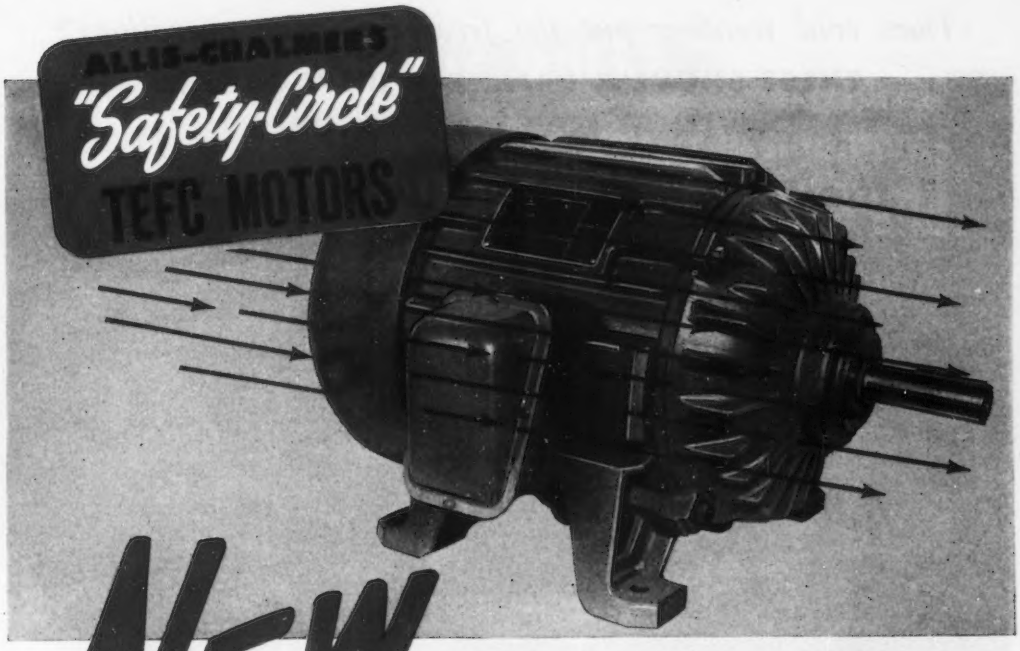

NEW Easy to Clean Protected From Dirt

THIS NEW *Safety Circle* totally-enclosed, fan-cooled motor cannot clog with dirt. The ribbed cooling surfaces are outside the motor. There are no pockets or crevices where dirt can collect. Cooling air is not enclosed at any point except the fan cover.

Cleaning is the simplest of maintenance operations done in a few seconds with an air hose. The fan cover also can be removed very quickly for a thorough cleaning.

Factory Lubricated Bearings

Bearings are lubricated at the factory and operate without attention or cost for years. The frame of this *Safety Circle* TEFC motor is cast iron, inherently corrosion resistant, strong and rigid. The extra rigidity of the cast iron frame holds the bearings in true alignment under severe operating conditions. This gives long bearing life and low operating costs.

Get All The Facts

The new *Safety Circle* totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224 to 505. Your Allis-Chalmers Authorized Dealer or Sales Office has complete information. Call today or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3235

Sold . . .
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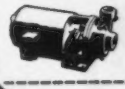
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

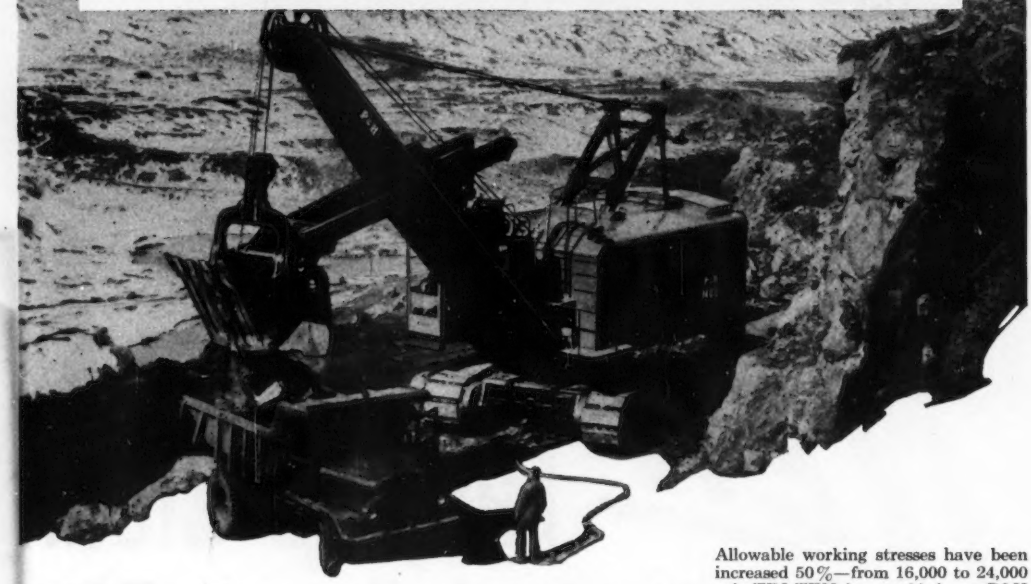
Safety Circle, Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Does cold weather put the freeze on your operations?

THESE SHOVELS CAN KEEP ON WORKING EVEN AT LOW TEMPERATURES

they're built with U·S·S TRI-TEN



HERE'S good news for power shovel users. In U·S·S TRI-TEN (manganese-nickel-copper steel) manufacturers of heavy duty excavating equipment have found a high strength structural steel with which they not only can reduce weight and increase strength but at the same time give vital operating parts the ability to withstand shock in low temperature service. Every contractor who has been plagued by part breakage during severe cold spells will appreciate what this means.

Here's what Harnischfeger Corporation has to say about U·S·S TRI-TEN:

"We have used U·S·S TRI-TEN principally in our excavator products. The continual trend to increased loading capacities together with more severe field service has greatly accelerated the use of this type of U·S·S High Strength Steel.

Our excavator design requires that the steel must have high yield and tensile strength, good corrosion resistance, and also must stand up at normal and sub-zero temperatures.

It must possess a high strength-to-weight ratio, good resistance to abrasion. Full size structures must exhibit high resistance to fatigue failure. The steel must, in addition, lend itself to economical fabrication and machining.

Our experience with P&H 1400 Excavator—in which TRI-TEN is used in dipper sticks, dipper, and in other stressed members—has shown that this steel satisfies all these requirements without adversely affecting the cost of our products.

Generally speaking, we have found that by replacing ordinary structural steel with TRI-TEN, the weight of our component parts has been reduced 25%. Allowable working stresses have been increased 50%—from 16,000 to 24,000 psi. TRI-TEN has enabled our P&H 1400 customers to operate this equipment in temperatures as low as minus 45°F.—which would have been impossible with ordinary structural steel."

If you would like to know how you can use TRI-TEN or the other U·S·S High Strength Steels to give you similar worthwhile results, write us.

U·S·S TRI-TEN is one of the family of U·S·S High Strength Steels which are suited to many of your special requirements. And, for even more stringent applications, we can also furnish U·S·S CARILLOY and U·S·S STAINLESS steels which are especially adapted to unusual jobs of industry. Our metallurgists will be glad to work with you to help you select the steel best suited to your job.

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UNITED STATES STEEL

MANCHA'S ELECTRIC MULES never balk at rough assignments

the tougher the job, the better they like it!

Here's one weighing 6 tons (Standard AN type) built especially for heavy loads and long hauls

1750

Rides as smooth as a rocking chair! No jolts . . . no bumps . . . no banging around. It's a pleasure!
That Trackmaster* design, an exclusive Mancha feature, does the trick—levels out rough track as if it weren't there. Swell break for the operator—and easy on the axles, motor and battery, too!
Gettin' technical . . . brake shoes and hangers mounted on longitudinal equalizers (whew!) follow every movement of the wheel and give perfect braking contact at all times.

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Here's why:

MOTORS: One or two—large enough to withstand sustained overloads.

TRANSMISSIONS: Several types — your job determines the one to be furnished.

FRAME: Side plates are of rolled steel. Bumpers are cast steel with rounded ends.

BATTERY BOX: Made of heavy sheet steel reinforced with angles at all corners and along the bottom edges. Hinged lids are supported in center by a channel running lengthwise of the box.

BEARINGS: Antifriction bearings are used throughout on all running parts.

Mancha's Electric Mules are available in a variety of sizes. From bumper to bumper each is designed by experienced engineers, and is manufactured in our own factory. Your inquiry regarding a locomotive to suit your requirements is invited. Mail the coupon for illustrated bulletin showing performance charts and complete specifications.

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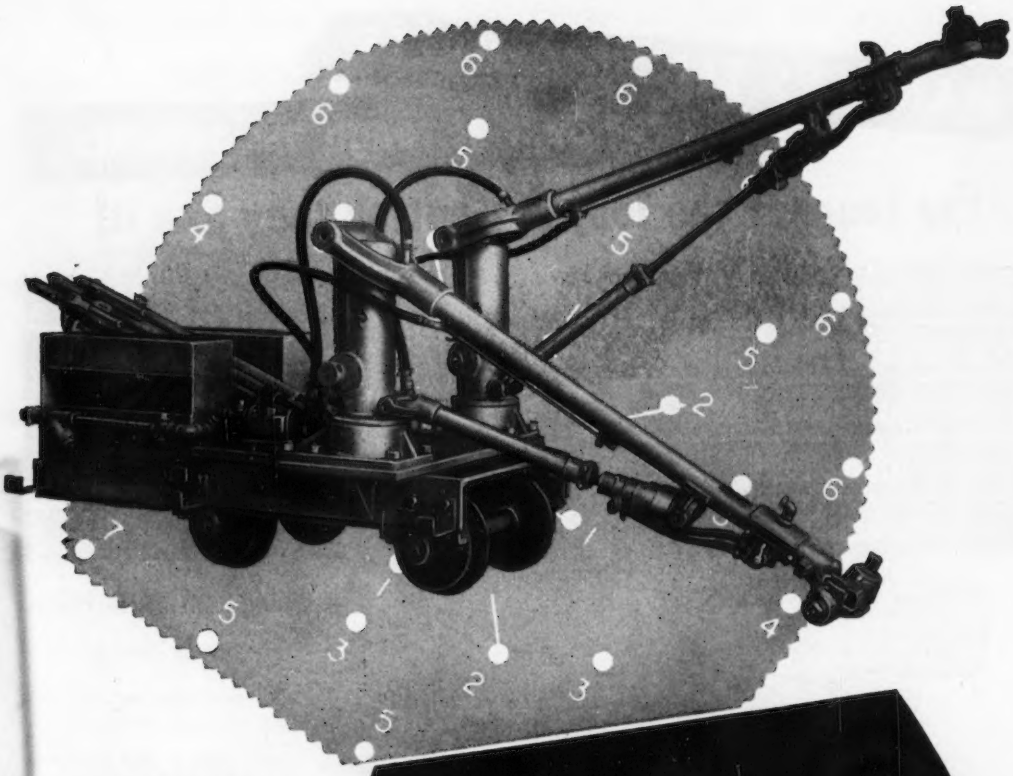
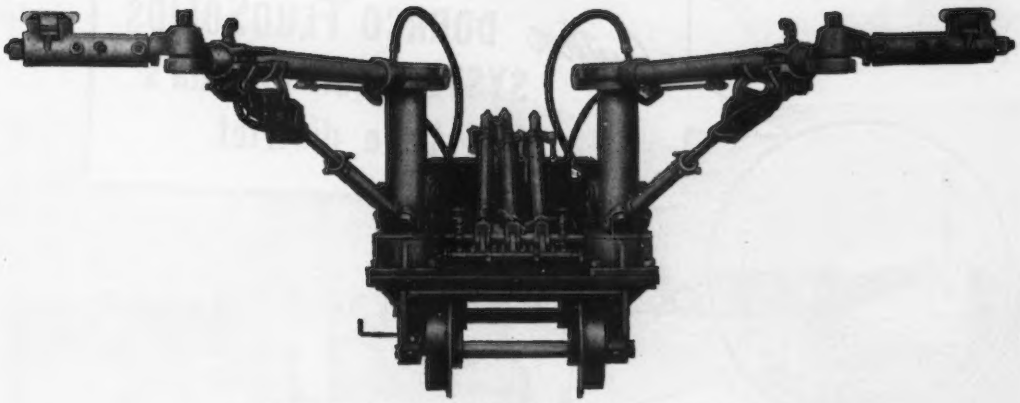


FOR HIGH-SPEED TUNNEL DRIVING

New CP G-600 Air Actuated Drill Jumbo provides maximum speed and efficiency for tunnel driving. Rail-mounted, it is built for all standard track gauges, in single or multiple-boom units.



Front view of Jumbo showing special cross arm construction.

outstanding operating features

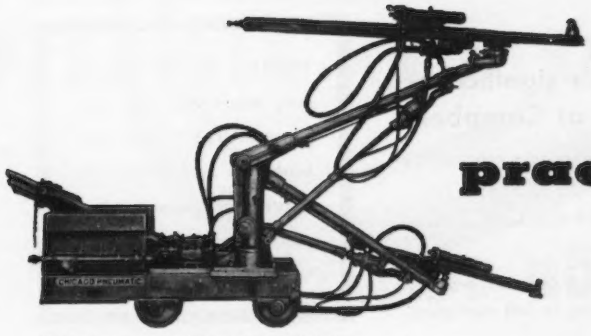
Booms are quickly adjustable to any drilling position.

Vertical adjustments are made by rotary air actuating motor.

Automatic safety locks prevent boom arms from settling.

Control valve of actuator motor is conveniently located at end of boom arm.

Dual valve handles permit operation from either side of boom.



Twin-boom unit with two typical drill mountings for mine headings up to 10′ x 12′. Upper arm has 6-foot chain type feed mounting. Lower arm has 4-foot shell type feed mounting.

practical design

Air to drifter and actuator motor passes through boom, eliminating awkward air hose. Water piping is protected by running under boom arm. Unit is readily disassembled and assembled. Component parts are of sizes easily handled on mine cages. For complete specifications write for copy of SP-3026.

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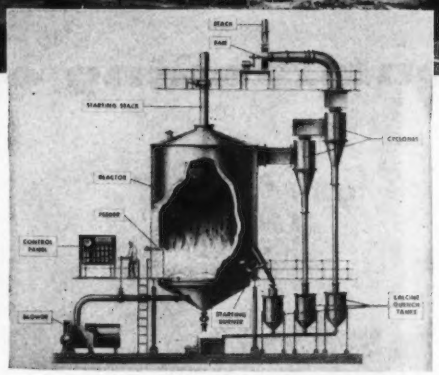
Another DORRCO FLUOSOLIDS SYSTEM for Canada's Red Lake district



Circled in the photo above is the FluoSolids building at Campbell Red Lake Mines Ltd. . . . another Dorrco FS System to be installed in Canada for the roasting of refractory arsenopyrite gold ores. With a design capacity of 65 tons per day, Campbell's FS System is roasting flotation concentrates for the elimination of arsenic and sulphur. The calcine is cyanided for gold recovery.

Three features of particular significance have been demonstrated at Campbell:

FIRST . . . the FS System is successfully roasting a concentrate containing only 18% sulphur . . . without auxiliary fuel.

SECOND . . . feed is being pumped to the FS Reactor as a slurry at 70 to 80% solids . . . without prior drying.

THIRD . . . it has been possible to shut down one shift per day with no difficulty experienced in returning to full operation.

Resultant low operating costs and low first cost as compared with conventional roasters make FluoSolids well worth careful investigation. If you have a roasting problem involving arsenopyrite or telluride gold ores we would like to give you further details.

DORRCO FLUOSOLIDS Systems employing single compartment reactors as illustrated are applicable to the roasting of refractory gold ore concentrates, copper and zinc concentrates, and pyrite.

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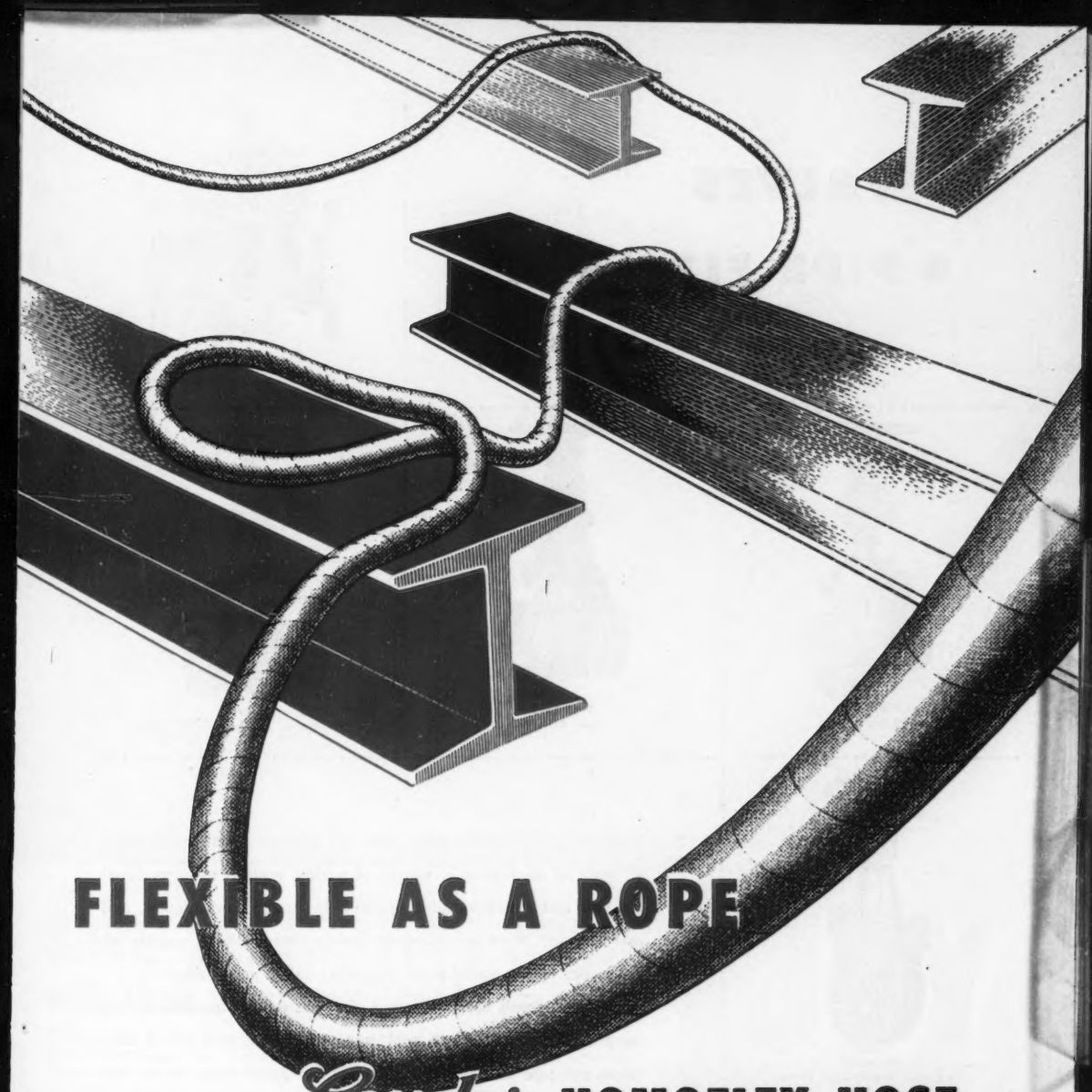
DORR

RESEARCH ENGINEERING EQUIPMENT



FLEXIBLE AS A ROPE

Condor HOMOFLEX HOSE

"Why, this hose is flexible as a rope!" say the men who work with it. • But it's no surprise to us—we engineered it that way. Homoflex has no pre-set twist, it coils and uncoils easily. It doesn't kink or collapse on sharp bends. It's light, but amply strong. It's easy to handle. It's sized uniformly. Workmen like it . . . It lasts longer. • How these advantages are built into Homoflex is in Bulletin 6879 D, mailed on request. • The same engineering goes into our V-belts, flat belting and conveyor belts. Just phone your R/M Distributor.

R/M

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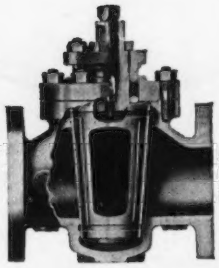
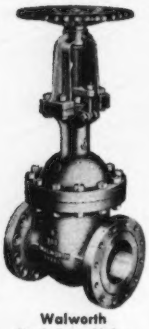
● PIPE FITTINGS



Walworth
Lubricated Plug Valve



Walworth
Steel Gate Valve

Walworth
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Walworth
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Walworth
Iron Body Saddle Gate Valve

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Cast Steel Flanged Fittings

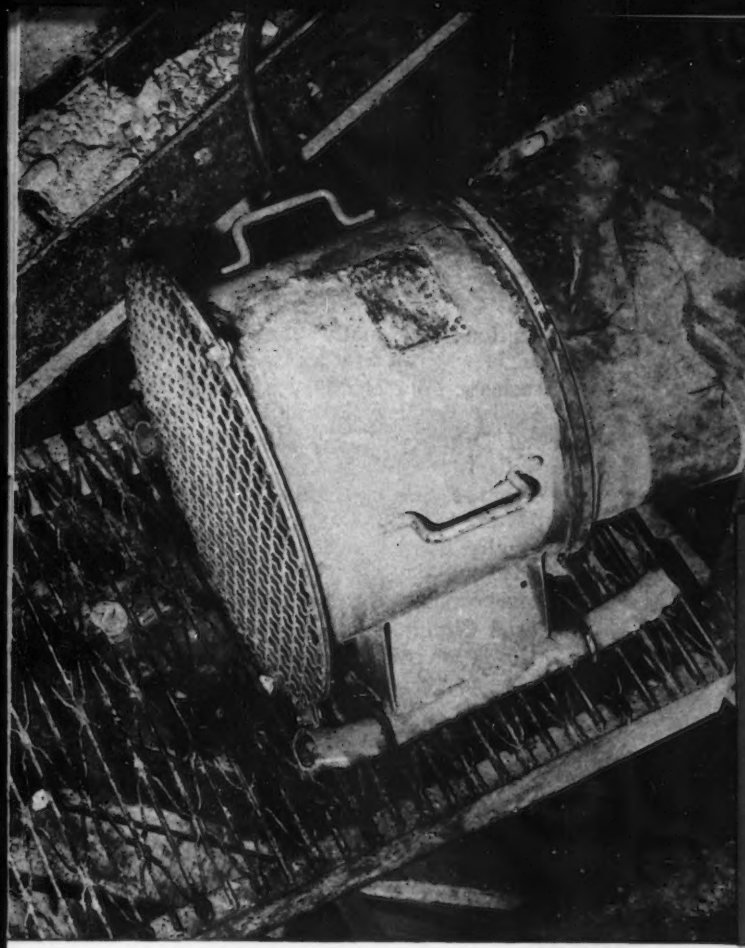
Walworth manufactures a ***complete line*** of valves and pipe fittings: all made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, Walworth products reflect more than a century of experience in the manufacture of quality valves and fittings.

Your Walworth distributor will give you full information on the ***complete line*** of Walworth steel, iron, and bronze, and special alloy valves and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

*Patented—Reg. U. S. Pat. Off.

WALWORTH
valves and fittings
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



Left: a JOY Type 1-16 Portable Mine Blower in service. Right, an 1-23, another of the broad JOY line.
Right: a JOY Series 1000 Axivane Adjustable Blade Fan, for intermediate ventilating needs up to 100,000 cfm.

SAVE VENTILATING COSTS

with these all-purpose, two-in-one units

JOY AXIVANE Portable Blowers are setting new records for low-cost ventilation wherever they're installed. Right at the start, their vaneaxial design principle is more compact and efficient, consuming less power for the required volume of air. And even more important, the high efficiency of JOY vaneaxial-type blowers is maintained over a much broader range of pressure than other designs. That means you can operate JOY Blowers economically in either low or high-pressure service—they're equally adaptable for use with short or long runs of tubing. For example, when you want to supply air to a deeper or more remote section of the mine, you no longer need a different type of blower for the new service—JOY AXIVANE Blowers can do the whole job. ● *Call on us for specifications and performance data—ask for Bulletin J-607.*

Consult a Joy Engineer

W & D M3411

JOY

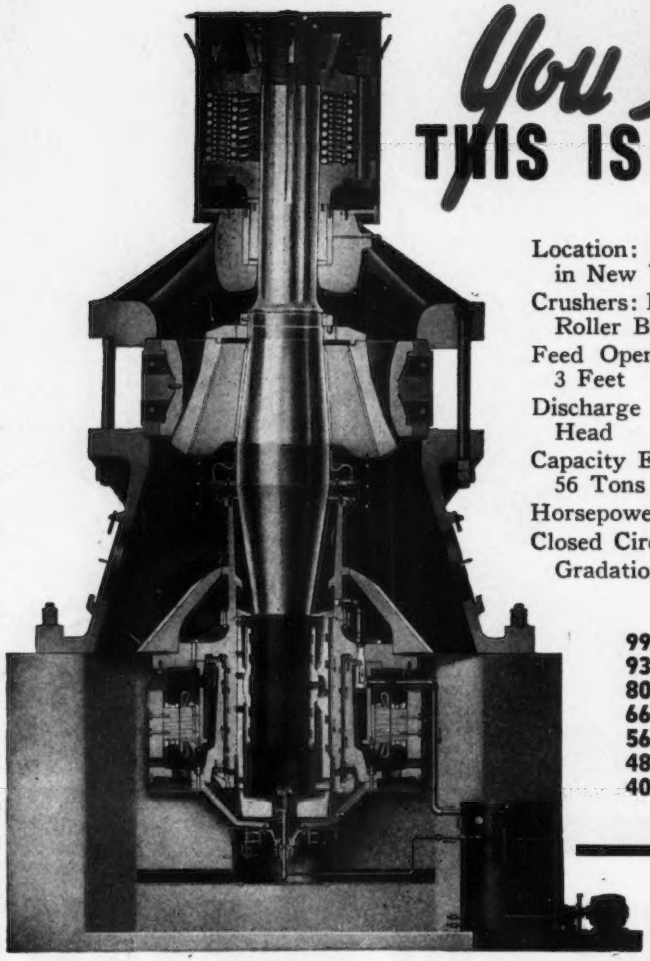
AXIVANE* PORTABLE BLOWERS

*Reg. U.S. Pat. Off.

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



You said it!
THIS IS PERFORMING

Location: Nationally known Mining Co. in New York State

Crushers: Four No. 37½ Kennedy type "S" Roller Bearing Gyratory Crushers

Feed Opening: 6¼"; Diameter of Head: 3 Feet

Discharge Setting: 7/32" Closed Side at Head

Capacity Each Crusher: 56 Tons Per Hour

Horsepower Each Crusher: 48 HP.

Closed Circuit Operation

Gradation As Follows:

PERFORMANCE

99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

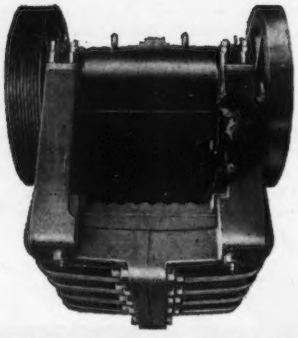
Performance? You said it!

You said it!
THIS IS TOPS IN SWING JAW ACTION

We said: "Less POWER-LOSS in the KVS Swing Jaw Crusher" because the STATIONARY jaw carries 50% of the crushing load, thereby saving power for crushing. Three important points tell more of the economies in this Swing Jaw Crusher:

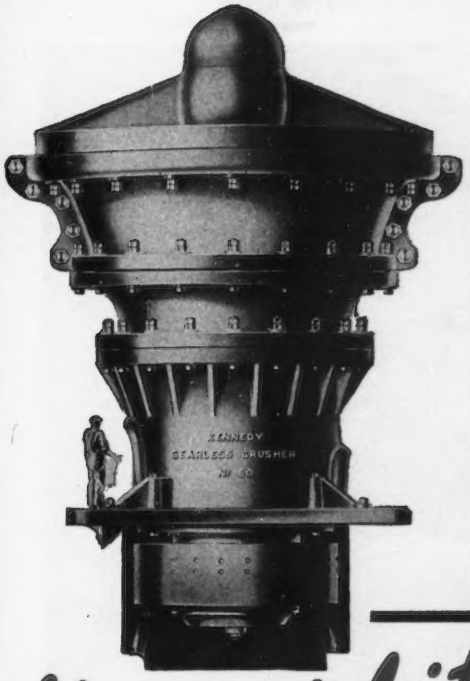
1. Shaft is cast INTEGRAL WITH THE SWING JAW giving low maintenance.
2. Swing and stationary jaw plates are INTERCHANGEABLE, and REVERSIBLE end for end giving longer wear.
3. NO BOLTS pass through the jaw plate—it is held in by keys.

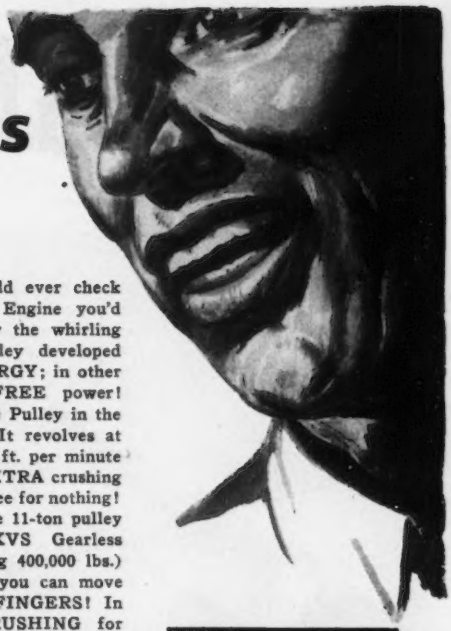
Value plus, you said it.



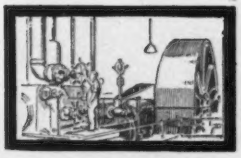
USERS SAY—"KVS PRODUCTS ARE BEST"

You said it!
THIS IS POWER plus



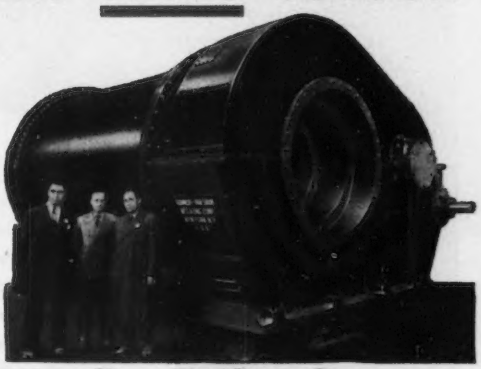


Say, if you could ever check an old Corliss Engine you'd quickly see how the whirling flywheel or pulley developed **KINETIC ENERGY**; in other words, added **FREE** power! So does the **BIG** Pulley in the **KVS Gearless!** It revolves at a speed of 3,500 ft. per minute —creates the **EXTRA** crushing power you get free for nothing! What's more, the 11-ton pulley (used in a **KVS Gearless** Crusher weighing 400,000 lbs.) turns so easily you can move it with **TWO FINGERS!** In short more **CRUSHING** for **LESS POWER COST** (with less vibration and **NOISE**), is the big **KVS Gearless** idea that put the **KVS Gearless** way out in front and keeps it there. And it makes good—you **SAID IT!**



You said it! THIS SAVES $5000.!

Like to save about $5,000 on the cost of a 10 ft. tube or ball mill? Buy a **KVS MILL** with integral gear drive! Because—with this drive, you can use a **SYNCHRONOUS MOTOR DIRECT CONNECTED** to driving shaft. This is where you make your big saving. Shaft carried in roller bearings that **CAN'T** be set wrong. Pinion shaft runs about 600 r.p.m. (in other mills it runs about 180 r.p.m.) **KVS** trunnions on large sized tube and ball mills **CARRIED ON OIL.** Bearing never wears out, uses little power. All gears and bearings automatically oil-sprayed before mill is started (pat'd.). In 15 years no **KVS** gears or pinions have worn out on this type mill. A good buy? **YOU SAID IT!**

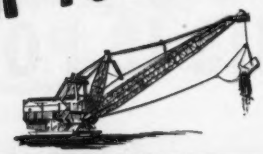


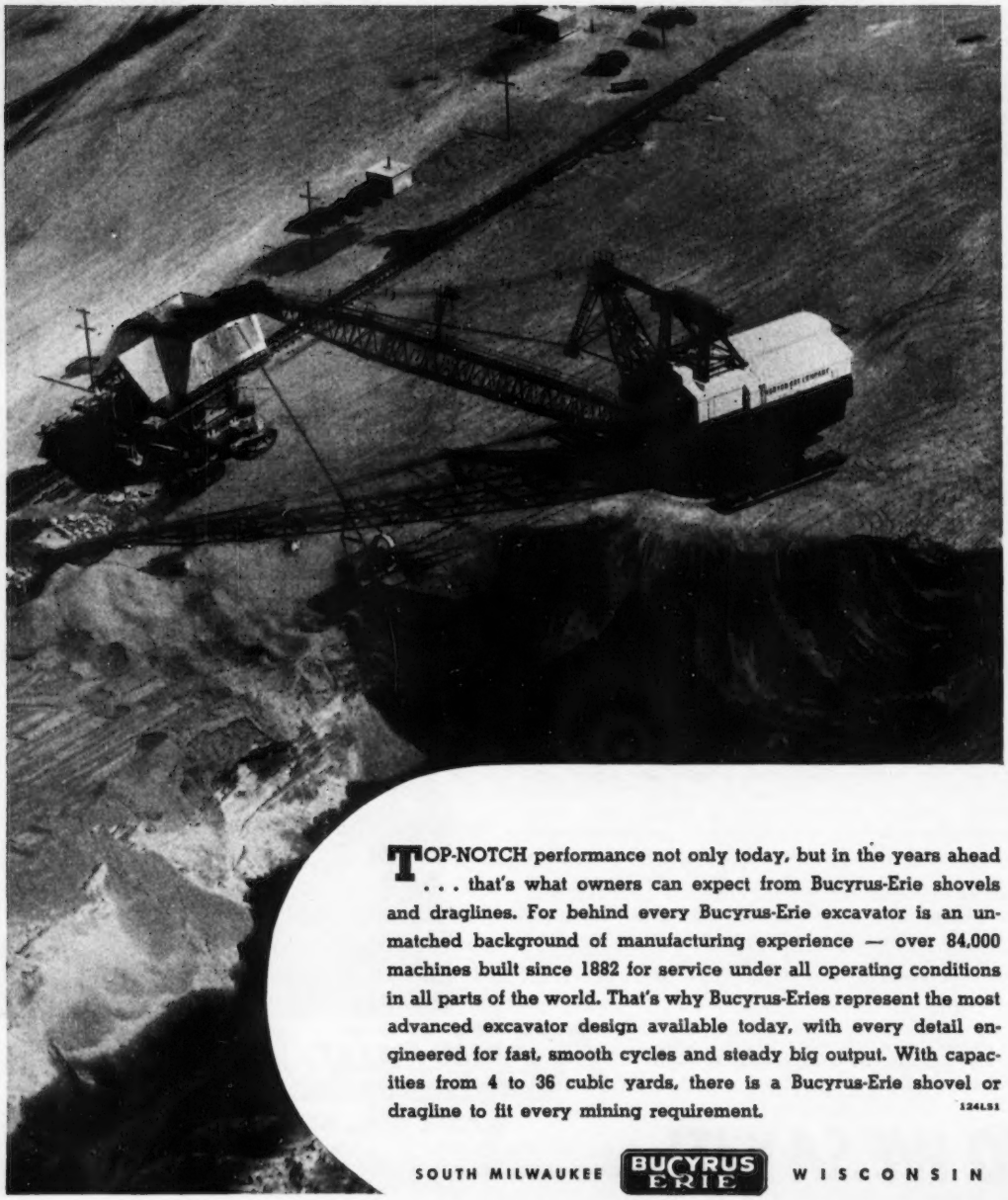
Have we Bulletins and Circulars fully describing these KVS products? Will we be glad to send them to you? YOU SAID IT!

Kennedy-Van Saun
MANUFACTURING AND ENGINEERING CORPORATION
2 PARK AVE., NEW YORK 16, N. Y.
FACTORIES:
DANVILLE, PA., U.S.A.
CANADA, ENGLAND, FRANCE, AUSTRALIA

—SO WE SAY IT!

DESIGNED FOR TOMORROW





TOP-NOTCH performance not only today, but in the years ahead . . . that's what owners can expect from Bucyrus-Erie shovels and draglines. For behind every Bucyrus-Erie excavator is an unmatched background of manufacturing experience — over 84,000 machines built since 1882 for service under all operating conditions in all parts of the world. That's why Bucyrus-Eries represent the most advanced excavator design available today, with every detail engineered for fast, smooth cycles and steady big output. With capacities from 4 to 36 cubic yards, there is a Bucyrus-Erie shovel or dragline to fit every mining requirement. 124LS1

SOUTH MILWAUKEE BUCYRUS ERIE WISCONSIN

you can stop dry drilling with a GARDNER-DENVER RB STOPER

An exclusive Gardner-Denver feature can help you eliminate dry drilling. It's the new *air-operated* water control valve — available only on Gardner-Denver RB Stopers.

This unique valve assures a flow of water to the face of work both before and during the drilling operation. *One* throttle valve, operated by a conventional throttle valve handle, controls all functions of drilling and water control. The desirable "water on—air on—air off—water off" cycle required in some localities is provided automatically.

and here's another RB advantage you'll like

The throttle valve is fitted with a tubular screen which is automatically cleaned by live air each time the handle is brought past the "off" position. Any accumulated dirt is blown out of the drill, and time out for cleaning a clogged screen is practically eliminated.

Gardner-Denver RB104 —the heavy-duty self-rotating stoper with exceptionally high drilling speeds.

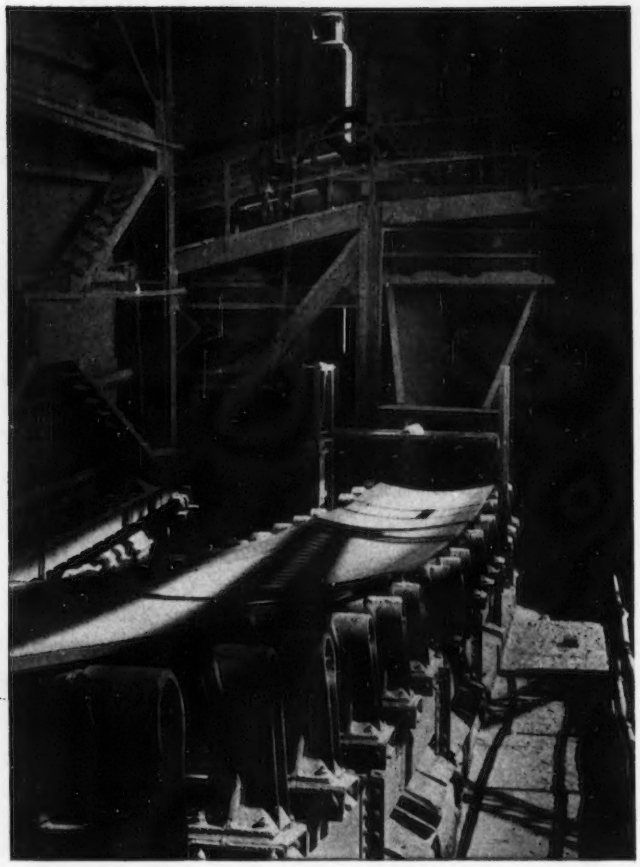
Gardner-Denver RB94 —the fast drilling, self-rotating stoper that weighs only 100 pounds.

Gardner-Denver Stopers are famous for their safe handling, fast drilling, smooth feeding and their constant sludge protection.

Bulletin SD2 gives complete information on Gardner-Denver Stopers —write today for your copy.

GARDNER-DENVER Since 1859

Gardner-Denver Company, Quincy, Illinois
In Canada:
Gardner-Denver Company (Canada), Ltd., Toronto, Ontario



HEAVIEST in the WORLD

And Still Going Strong

After a Quarter Century "At Hard Labor"

For more than twenty-five years this S-A heavy duty belt conveyor system has been moving crushed ore on the most economical cost-per-ton basis.

Whether your conveying problems are large or small, you can depend on S-A engineers to help you find the handling system that will best serve your needs at the lowest possible operating cost.

A complete line of bulk handling machinery plus 50 years of practical experience with all kinds of conveying problems means that S-A is well qualified to help you put your bulk handling operations on the most economical basis. Write us today . . . no obligation, of course.

SOUTH AMERICAN COPPER MINE

Photo shows a transfer point between two 60-inch wide belt conveyors handling primary crushed ore. Belt carriers used on these conveyors are S-A "Mammoth" type weighing 950 pounds each which make them the heaviest and most rugged pieces of equipment of this type in the world. Belt conveyor in foreground moves ore in large volume up to secondary crushing plant.

1901-1951

50 years experience with bulk handling

STEPHEN S-A ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois · Los Angeles, Calif. · Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

The Great New Mining Tire

Job-Fitted

to your exact requirements!

BETTER OFF-THE-ROAD PERFORMANCE! *Now, for the first time, you have a genuine general utility mining tire that does its job off the road as no tire ever did before it—with entirely new* **PENETRATION** *and* **TRACTION**—*with* **TREAD** *and* **CARCASS JOB-FITTED** *to match the roughest and toughest going.*

BETTER ON-THE-ROAD PERFORMANCE! *Yes, and when you pull, loaded or empty, onto the road or highway, you have a* **SMOOTH-ROLLING ANTI-SKID TIRE** *to match its* **OFF-THE-ROAD EFFICIENCY!**

BETTER *IN CONSTRUCTION!* The Fleetmaster is a new and revolutionary tire, job-fitted and actually designed for the mining work it must do—with **TREAD COMPOUNDS TO YOUR EXACT REQUIREMENTS**—with a 70% **DEEPER TRACTION TREAD**—with **ENTIRELY NEW *INNER CAVITY FORM*** (round moulded to the tire's inflated shape allowing deeper traction tread, thicker under tread).

BETTER *IN TREAD AND CARCASS LIFE!* From the massive records of other users, these great Fleetmasters should give **YOU** what they are giving everywhere—up to **50% MORE ACTUAL TIRE LIFE.**

BEFORE YOU INVEST A PENNY! ***Get our complete proof demonstration! A phone call does it—to your nearest U. S. Royal Dealer***

UNITED STATES RUBBER COMPANY

Excellent fragmentation from "Nitramon" —"Nitramex" No. 2 blast.

Blasting is SAFER and more ECONOMICAL

. . . at the Mesabi Chief Mine where Du Pont "Nitramon" and "Nitramex" No. 2 cut production costs

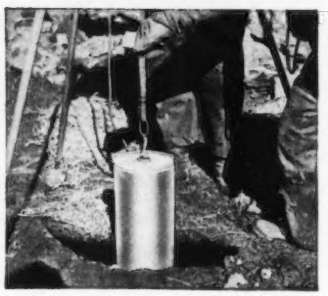
The stripping program at this M. A. Hanna Company mine in Keewatin, Minnesota, calls for the shooting of 1,800,000 cubic yards of taconite during a six-month period. Naturally, economy and safety were important factors on this job. That's why the dependable team of Du Pont "Nitramon"* and "Nitramex"** No. 2 blasting agents were selected.

Safety is an outstanding characteristic of both "Nitramon" and "Nitramex" No. 2. They cannot be detonated by friction, "Primacord" or even the impact of ball ammunition. Yet they are readily detonated with "Nitramon" Primer, fired with "Primacord."

Extra convenience speeds work when these dependable blasting agents are used. "Nitramon" and "Nitramex" No. 2 are packaged in sturdy, water-resistant metal containers. And since they contain no nitroglycerin, they're non-headache producing. This means less trouble . . . faster work.

Results are far superior to those obtained with ordinary explosives. Fragmentation is excellent even when holes are widely spaced in the tough-shooting taconite. And bottoms pull exceedingly well. The well-broken rock allows shovels to proceed on an uninterrupted schedule.

Ask any Du Pont Explosives representative for complete information about these or any other Du Pont blasting products for safer and more economical ore production. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.



Loading crew lower "Nitramex" No. 2 into a hole. Holes average 35 ft. in depth, are spaced 27 x 27 ft.

Shots are easily and quickly primed with "Nitramon" Primer. Average load per hole is about 600 lbs.

*Reg. trade-mark for nitrocarbonitrate blasting agent
**Reg. trade-mark for ammonium nitrate blasting agent

DU PONT "NITRAMEX" No. 2

Not currently for sale in western states

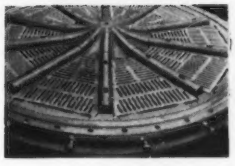
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

ACTUAL INSTALLATIONS PROVE MARCY MILL DESIGN GIVES . . .

- Greater grinding capacity
- More uniform grinding
- Less overgrinding
- Lower power consumption per ton of feed
- Lower maintenance costs per ton of feed

Results are available to mill operators on comparison tests of grinding mills of equal size. In every instance the Marcy shows perceptible advantages in capacity and per ton costs. Competent, trained M & S engineers can give you the benefit of our long experience and complete milling data.



MARCY LOW-PULP-LINE GRATE DISCHARGE

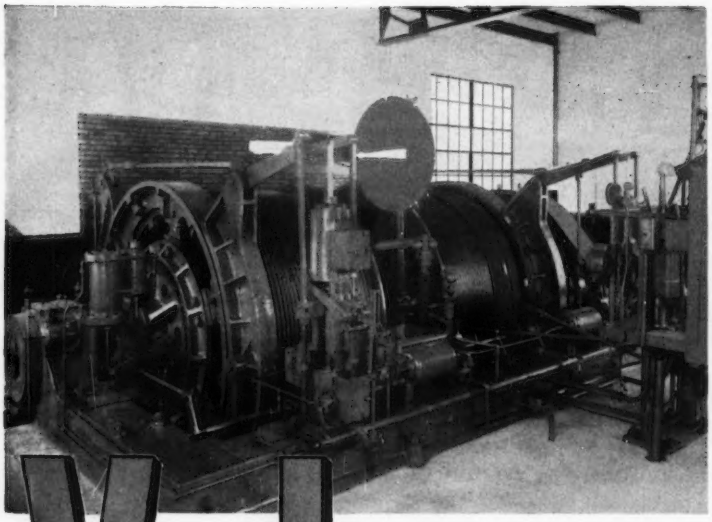
gets rid of fines before they are overground . . . puts the grinding effort where you want it.

OTHER MASSCO PRODUCTS

Massco Fahrenwald Flotation Machines; Genuine Wilfley Tables; Massco-McCarthy Hot Millers; Rock Bit Grinders; Density Controllers; Belt Feeders; Rubber Pinch Valves; Assay and Laboratory Supplies and Equipment; Complete Milling Plants.

Main Office: DENVER, COLORADO, U.S.A.; El Paso; Salt Lake City; 1775 Broadway, New York, N. Y.; Canadian Vickers, Ltd., Montreal; W. R. Judson, Santiago and Lima; The Edward J. Nell Co., Manila, P. I.; The Ore & Chemical Corp., 80 Broad St., New York 4, N. Y., Representatives for Continental Europe.

THE Mine & Smelter SUPPLY COMPANY



22 Years of Trouble-Free Service And Still Going Strong

Installed at a well-known mining operation in 1928, this 900 hp. double-drum hoist has not only given "Very Satisfactory Service" for more than 22 years but is still, apparently, as good as ever. The cylindrical drums are 9' in diameter by 4'-10" face, grooved for 1⅛" rope. One drum is provided with a positive tooth-type clutch for safe hoisting from different levels, and both drums have parallel-motion post-type brakes. Brake and Clutch engines are air-operated. Vulcan Safety Devices provide dependable protection against any damage that might otherwise be caused by current failure, overspeeding, over-winding or starting in the wrong direction.

Vulcan HOISTS and SHEAVES Are ALWAYS Dependable

For more than a hundred years the Vulcan Iron Works has been building good mine hoists—taking such full advantage of every proved advance in design, materials and accessory equipment that Vulcan Hoists, today, are unsurpassed from every standpoint of Speed, Safety and Operating Convenience. The hoist illustrated and described above embodies only one of the many Vulcan designs that have proved their dependability through long years of trouble-free service and new designs are constantly being developed to meet specific operating conditions.

Correspondence regarding any mine hoisting requirement, no matter how large or how small, is cordially invited. Our experienced engineers welcome opportunities to make money-saving suggestions, whenever possible, without charge or obligation. Ask, also, for Bulletin A-409; its 32 fully-illustrated pages are packed with information regarding all types and sizes of Vulcan Hoists.

Illustration above shows a Vulcan ALLCASTEEL sheave mounted on self-aligning roller-bearing pillow blocks. Another popular type has tapered roller bearings in the hub and revolves around a dead shaft held in steel clamp-type pedestals. Besides being light and very strong, Vulcan ALLCASTEEL sheaves are so highly resistant to rope wear that NO LINERS ARE NEEDED. Available in a wide range of types and sizes with either plain or anti-friction bearings.

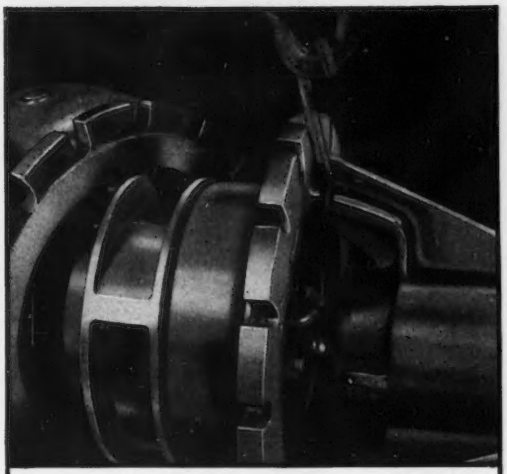
VULCAN IRON WORKS • WILKES-BARRE, PA. U. S. A.

Heavy-Duty Electric Hoists	Shaking-Chute Conveyors	Steam Locomotives	Load-Carrying Larries
Self-Contained Hoists	Chain Conveyors	Diesel Locomotives	Rotary Kilns, Coolers and Dryers
Scraper Hoists	Cast-Steel Sheaves and Gears	geared and electric drive	Briquetting Machines
Car-Spotting Hoists	Cages, Skips and Gunboats	Gasoline Locomotives	Heavy Special Machinery
Room Hoists	Toothed Double-Roll Crushers	geared and electric drive	Open-Hearth Steel Castings

Remove Rotating Element in 5 Minutes!

ALLIS-CHALMERS SOLIDS HANDLING PUMP

1. Remove Casing Bolts lift and disconnect drive. Just loosen bolts and bolt assembly from slot. Bolt, nut and washers are still connected for easy reassembly.



2. Swing Out Rotating Element. Neither suction nor discharge piping need be disturbed. All wearing parts are fully accessible for inspection or servicing.

THE PUMP IS BACK IN SERVICE IN LESS THAN A HALF HOUR

QUICK, EASY SERVICE AND LONG RUNS between servicings are the two things operators want most in solids handling pumps. You can see for yourself how quick and easy service is with an Allis-Chalmers Solids Handling pump.

You get long life, too, because Allis-Chalmers Solids Handling Pumps are made of special hard *Allisite* alloy . . . because they have thick sections and heavy parts throughout . . . and because they are application engineered by specialists who know solids handling problems and how to solve them.

Get complete information on Allis-Chalmers Solids Handling pumps from your nearest Allis-Chalmers Sales Office. Or write for Bulletin 08B6381.

ALLIS-CHALMERS, 969A SO. 70 ST.
MILWAUKEE, WIS.

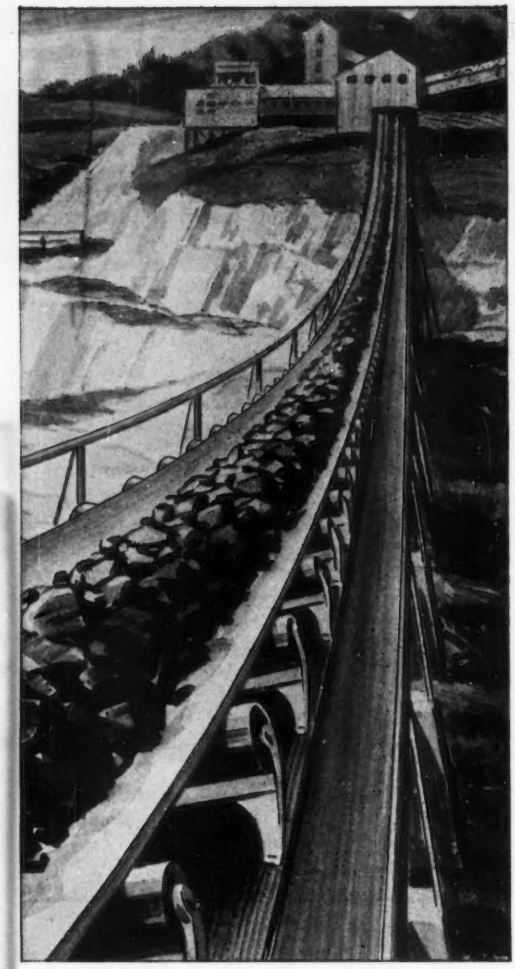
A-3216

Allisite is an Allis-Chalmers trademark.

ONLY FIVE WEARING PARTS

Shaft sleeve, impeller, casing, two wear plates. All easy to handle and easy to replace.

ALLIS-CHALMERS



LONGER LIFTS. The high tensile strength of "Cordura" Rayon eliminates costly transfer points. For example, a belt reinforced with seven plies of "Cordura" can lift 1000 tons of overburden per hour up a 15° slope over 1000-foot centers. It has design tension of 900 pounds per inch of width.

POINTS TO CONSIDER BEFORE YOU BUY YOUR NEXT CONVEYOR BELT

Shown on this page are some of the reasons why more and more economy-minded operators are planning to have their next conveyor belt built on Du Pont Cordura* High Tenacity Rayon.

"Cordura" has so much extra strength over natural fibers previously used that it provides a thinner yet stronger belt . . . at no extra cost.

You may already know "Cordura" Rayon as the yarn that makes tougher truck tires, stronger high-pressure hose and longer-lasting V-belts. We'll be glad to send you the names of suppliers of conveyor belts improved with this industrial rayon.

You can also get full information about "Cordura" in the new manual, "Sinews for Industry." It gives physical properties of "Cordura" rayon, describes many successful applications and tells how "Cordura" improves the efficiency of conveyor systems. For your free copy, address Room 4529, Rayon Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

Reg. U. S. Pat. Off.

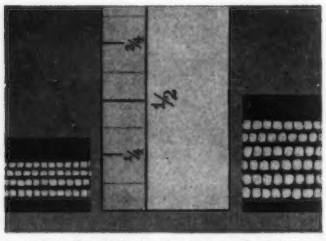
DU PONT "CORDURA" HIGH TENACITY RAYON

DU PONT

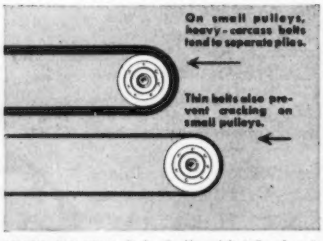
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

for RAYON . . . for NYLON . . . for fibers to come look to DU PONT



GREATER STRENGTH of belts built with "Cordura" is illustrated above. At left is cross-section of four-ply belt sinewed with "Cordura." It's stronger than conventional 6-ply belt at right, yet only half as thick. This thin, light belt is particularly desirable where panel equipment is moved frequently.



MORE FLEXIBLE. Belts built with "Cordura" have less tendency to crack and separate plies when run over small pulleys required in confined working space. And belts built with "Cordura" have less stretch, so less take-up room is needed. And they trough well under any loading conditions.

HEAVIER LOADING is possible on conveyor belts built with Du Pont "Cordura" High Tenacity Rayon. This yarn is inherently stronger than the natural fibers commonly used. It packs extra strength into conveyor belts and enables them to carry loads to the capacity of power equipment.

Speed THIS EXPLORATION STEP!

All exploration comes at last to this—the slow and rugged job of collecting facts on the ground. It's the essential step.

But today footslogging *follows* aerial exploration. Now ground crews are directed to the *most promising* areas by photo-mapping and precise aerial magnetic surveys, and there make detailed studies. Thus the difficult and expensive ground survey is expanded in effectiveness and reduced in cost, and the whole exploration effort is greatly speeded.

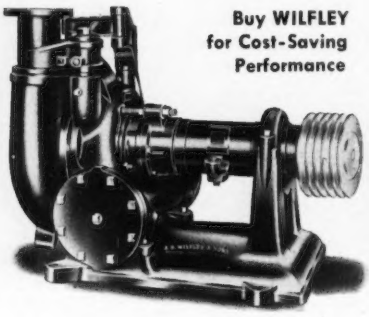
Aero Service, a pioneer in airborne magnetometer surveys, cuts schedules from years to weeks or months . . . and does the work at a fraction of the cost of ground surveys. AERO's magnetic intensity records are accurate within 1 to 2 gamma—a precision resulting from AERO's more than a quarter million miles of aerial exploration.

Discuss your exploration problems with AERO. Let us help you direct your ground surveys to areas of greatest interest. Our worldwide mapping experience is unparalleled.

TOPOGRAPHIC MAPS • PLANIMETRIC MAPS
PRECISE AERIAL MOSAICS • AIRBORNE MAGNETOMETER SURVEYS
RELIEF MODELS • COLOR PHOTOGRAPHY

AERO
SERVICE CORPORATION
236 E. COURTLAND ST., PHILA. 20, PA.
Oldest Flying Corporation in the World

For mill pulp

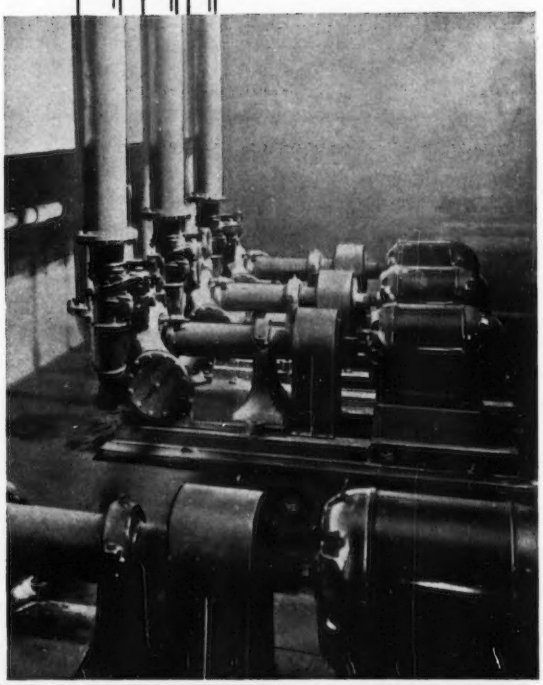


Buy WILFLEY
for Cost-Saving
Performance

WILFLEY
centrifugal PUMPS

Companion to famous
WILFLEY Acid Pumps

A large Western copper mill depends on this bank of 8" WILFLEY Rubber Lined Sand Pumps for handling mill pulp on an economical basis. ⟶



Mill pulp, sands, slimes, or slurries of any kind—all are handled efficiently and economically by famous Wilfley Sand Pumps. And now the new WILFLEY Model K Centrifugal Sand Pump offers many important mechanical improvements which give you even greater dollar savings—in power and production. This rugged, heavy-duty new pump delivers continuous, trouble-free performance, stepped-up production and dependable service. Individual engineering on every application—an economical size for every pumping requirement. Write or wire for details.

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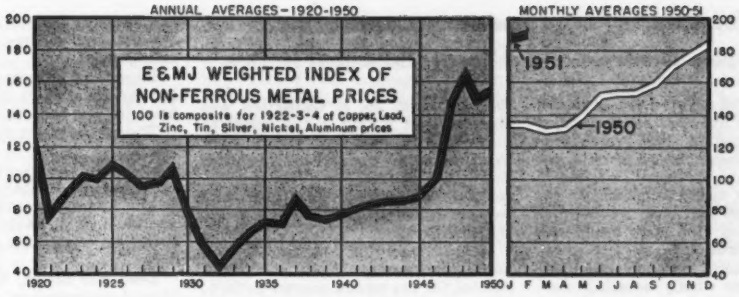
E&MJ OUTLOOK

PRICES



MARKETS

Although producers are holding the line on major metals, the E&MJ index of non-ferrous metal prices rose to a new all-time high of 194.06 for February, against 135.65 in February last year. January's mark was 192.49. Higher monthly averages for tin and silver caused this latest jump.

Tin got completely out of hand during February but there were signs of returning sanity as the month ended. Demand for other metals runs well ahead of supply, and should stay that way, through April, at least.

LABOR

Economic Stabilizer **Eric Johnston's "wage freeze" order** holds so much anti-freeze (in exempting fringe benefits and living-cost contracts) that no real wage stabilization is in sight. The general public will pay, as usual.

Labor's walk-out on Government's defense activities was a blow aimed straight at Charles E. Wilson. The betting is that he can take it.

AT HOME

There's still no sign of any determined Governmental effort to stop further inflation. Expect higher wages and prices, and hope for the best.

With bonuses for new production ranging up to $35,000, and with base payments increased to $1.50-$3.50 per lb. U_3O_8, the AEC means to get more uranium or else. These new schedules will make uranium mining in the Colorado plateau area a multi-million-dollar-a-year business.

Ore allocation, manganese, chrome, etc., is with us for a long stay.

More and more people want gold as an inflation hedge, and they want it minted. Gold coins now bring $53.50 per oz. in the New York black market; bar gold, only $44. Some enterprising government could thereby make a neat profit and also help the little fellows hedge against devaluation.

Charles E. Wilson, who only two months ago opposed the St. Lawrence Seaway, now actively favors it. It will probably go through soon.

Freeport Sulphur optioned a pyrrhotite property in Virginia as a sulphur source. Allied Chemical once had it, but let it go.

It looks as if **mining's depletion allowance** is safe for another year. The Treasury has given up the attack. But a corporate tax hike is coming.

ABROAD

Noranda will spend up to $15,000,000 on a new copper orebody in Canada's Gaspe Peninsula.

The ECA is making mineral development contracts right and left. For example, over $4,000,000 is going for base metal exploration in French Equatorial Africa. Payment will be in metals.

MARKETS—Trends and Prices

Demand for Copper, Lead and Zinc Continues at High Level Despite Controls—To Allocate Manganese Ore

THE ONE-MONTH old price freeze caused comparatively little confusion in major non-ferrous metals. The "voluntary" controls on copper, lead and zinc, announced early in January, resulted in a steady flow of these metals at unchanged prices. However, where foreign metals and ores were concerned, normal trade was disrupted and quotations named here, particularly on end products, were wholly nominal. Foreign demands for strategic metals and minerals increased and prices abroad advanced substantially above the levels named a month previous.

Though the demand for non-ferrous metals in the United States market during February continued on a high plane, purchasing agents appeared to be interested chiefly in obtaining nearby material and exhibited increasing caution in the matter of forward commitments. Price control was a factor.

Production for the civilian economy is expected to remain at a high level throughout the first quarter and possibly during April and May. The Federal Reserve Board's index of industrial production in January rose to 219% of the 1935-39 average, the highest since June, 1945. The index for February will be down slightly, according to preliminary estimates, owing to railroad and textile strikes.

Reflecting higher monthly averages for tin and foreign silver, the E & MJ index of non-ferrous metal prices climbed to 194.06 in February, which compares with 135.65 a year ago and 185.75 in the same month of 1949.

Futures Trading Halts

The Commodity Exchange suspended trading in metal futures for about three weeks, following publication of the price freeze order. Trading in copper, lead and zinc was resumed Feb. 17, but only for liquidation of the open interest in these metals. Regular trading in tin futures was continued. However, most of the activities of the Exchange were placed in suspension.

The flow of scrap to primary and secondary smelters has dropped off sharply and threatens to reduce output. Price ceilings for scrap have been readied in the major metals and were to have been issued "shortly." In the meantime, the general pricing order, under which holders of scrap have their individual ceilings, has brought all kinds of quotations into the market. On No. 1 copper scrap it was reported that 31c. per pound was asked in the outside market. The treatment charge on battery plates has declined to $25 @ $30 per ton to step up the intake, a drop of about $5. A regulation was issued to put a stop to the excessive conversion of scrap into slab zinc at the expense of the zinc dust supply. Conversion of scrap into slab zinc, instead of dust, increased 80% in December, according to the National Production Authority.

Use of steel for automobiles and numerous consumer goods will be restricted for the second quarter by 20%. This action will automatically cut into the non-military requirements of non-ferrous metals.

Manganese Allocation

Delivery and use of manganese ore was placed under allocation by the Defense Minerals Administration, effective March 31. Order MO-2 prohibits virtually all deliveries not covered by allocation authorizations. It calls for monthly reports of inventory and anticipated supplies. The allocation program has been designed to avoid needless interruption of supply to normal channels of consumption. The only deliveries of manganese ore exempted from the order are: (1) those to the General Services Administration for stockpiling; (2) those made for the purpose of resale only; and (3) those involving ore containing less than 35% manganese on a dry basis.

Lead and antimony were placed under inventory control, effective Feb. 16. The order limits the size of a person's inventory to 60-days normal supply and covers the holdings of the metals as well as products containing the metals.

Six countries, operating within a central organization known as the International Materials Conference, began a series of meetings in Washington on Feb. 26 for increased production and allocation of strategic raw materials. Included in the list of items are copper, lead, zinc, manganese, nickel, tungsten, molybdenum and sulphur. Uneven distribution of essential materials is limiting the defense effort in a number of countries.

Copper Remains Tight

The supply situation in copper has not improved. To ease the situation, producers who find themselves hard pressed in making deliveries to the stockpile may extend their contracts over a longer period. Production of crude copper in the United States in January totaled 87,109 tons, against 91,218 tons in December. Production of refined copper in this country during January totaled 110,144 tons; deliveries to customers amounted to 108,128 tons.

Imports of refined copper in December totaled 27,973 tons, raising the total for last year to 319,916 tons.

Though agitation for the temporary suspension of the 2c. import duty on copper continued, nothing was done to bring the issue before Congress. Prices named by copper producers continued on the basis of 24½c. per pound. On imported copper the buyer pays the duty.

Lead was active. With prices paid abroad commanding a premium, the trade fears that supplies of foreign lead coming into this market will fall off, perhaps appreciably. Though the market here was maintained at 17c. per pound, New York, foreign business was noted at 19c. and 19½c. per pound, f.a.s. Gulf ports. The British Ministry of Supply paid at least 19c. per pound for 10,000 tons of Mexican lead for delivery in the second half of 1951.

Average Prices for February (E&MJ Quotations)

Copper:	
Electrolytic, Domestic, Refinery	24.200
Electrolytic, Export, Refinery	24.425
Lead:	
Common, New York	17.000
Common, St. Louis	16.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	90.160
Silver, London, pence per oz.	78.500
Sterling Exchange, "Checks"	280.000
Zinc:	
Prime Western, East St. Louis	17.500
Tin:	
New York Straits	182.716
New York, 99% min. (e)	181.716
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$215.273
Antimony (E&MJ) (d)	45.280
Antimony, bulk, Laredo	42.000
Antimony, in cases, Laredo	42.500
Platinum, refined, per oz.	$90.000
Cadmium (a)	255.000
Cadmium (b)	267.500
Cadmium (c)	280.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	50.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange, checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

With more drastic cuts in use of zinc for civilian products coming, producers believe that the supply situation should ease somewhat in the second quarter. However, rising prices for zinc abroad tend to divert more concentrate to foreign smelters, which would reduce output of slab zinc in this country. Prime Western zinc continued at 17½c., East St. Louis. On export business 27c. per pound and higher was paid, f.a.s. Gulf ports.

The advance in tin prices abroad continued until late in the month. Operators abroad became jittery on rumors of reduced stockpile buying and possible control of the metal. Quotations here were frozen temporarily by the pricing regulations and business in the open market almost ceased entirely. On the last day of February, prompt tin sold at prices ranging from 1.81½c. to 1.82½c. per pound. Use of tin for tinplate is being reduced, along with curtailment in other directions.

Tungsten ore moved up to the equivalent of $82.50 per short ton unit in London, whereas the highest price named here under the price freeze was $65.

Acting on the recommendation of a Senate Subcommittee, which described the rise in tin prices as "gouging" by some of our international friends, the General Services Administration announced March 6 that it would suspend stockpile purchases of the metal "until the price reaches a reasonable level. Foreign markets weakened. The Committee also suggested that buying of tin for use by industry be placed in the hands of a Government agency.

Major Metals

U. S. DAILY AND AVERAGE PRICES

	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
Feb. 1951						
1	24.200	24.425	182.500	17.000	16.800	17.500
2	24.200	24.425	183.500	17.000	16.800	17.500
3	No Market	24.425	182.500	17.000	16.800	17.500
5	24.200	24.425	182.500	17.000	16.800	17.500
6	24.200	24.425	182.500	17.000	16.800	17.500
7	24.200	24.425	182.500	17.000	16.800	17.500
8	24.200	24.425	182.500	17.000	16.800	17.500
9	24.200	24.425	182.500	17.000	16.800	17.500
10	No Market	24.425	182.500	17.000	16.800	17.500
12	Holiday	24.425	Holiday	Holiday	Holiday	Holiday
13	24.200	24.425	183.000	17.000	16.800	17.500
14	24.200	24.425	183.000	17.000	16.800	17.500
15	24.200	24.425	183.000	17.000	16.800	17.500
16	24.200	24.425	183.000	17.000	16.800	17.500
17	No Market	24.425	183.000	17.000	16.800	17.500
19	24.200	24.425	183.000	17.000	16.800	17.500
20	24.200	24.425	183.000	17.000	16.800	17.500
21	24.200	24.425	183.000	17.000	16.800	17.500
22	Holiday	24.425	Holiday	Holiday	Holiday	Holiday
23	24.200	24.425	183.000	17.000	16.800	17.500
24	No Market	24.425	183.000	17.000	16.800	17.500
26	24.200	24.425	182.625	17.000	16.800	17.500
27	24.200	24.425	182.625	17.000	16.800	17.500
28	24.200	24.425	182.000	17.000	16.800	17.500
AVERAGES FOR MONTH						
Feb.	24.200	24.425	182.716	17.000	16.800	17.500
AVERAGES FOR WEEK						
Feb.						
7	24.200	24.425	182.500	17.000	16.800	17.500
14	24.200	24.425	182.700	17.000	16.800	17.500
21	24.200	24.425	183.000	17.000	16.800	17.500
28	24.200	24.425	182.650	17.000	16.800	17.500
CALENDAR WEEK AVERAGES						
Feb.						
3	24.200	24.425	182.667	17.000	16.800	17.500
10	24.200	24.425	182.500	17.000	16.800	17.500
17	24.200	24.425	183.000	17.000	16.800	17.500
24	24.200	24.425	183.000	17.000	16.800	17.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
Feb. 1951					
1	280.000	90.160	78.500d.	248s.	$35.00
2	280.000	90.160	78.500d.	248s.	35.00
3	(e)	(e)	(e)	(e)	35.00
5	280.000	90.160	78.500d.	248s.	35.00
6	280.000	90.160	78.500d.	248s.	35.00
7	280.000	90.160	78.500d.	248s.	35.00
8	280.000	90.160	78.500d.	248s.	35.00
9	280.000	90.160	78.500d.	248s.	35.00
10	(e)	(e)	(e)	(e)	35.00
12	Holiday	Holiday	78.500d.	248s.	Holiday
13	280.000	90.160	78.500d.	248s.	35.00
14	280.000	90.160	78.500d.	248s.	35.00
15	280.000	90.160	78.500d.	248s.	35.00
16	280.000	90.160	78.500d.	248s.	35.00
17	(e)	(e)	(e)	(e)	35.00
19	280.000	90.160	78.500d.	248s.	35.00
20	280.000	90.160	78.500d.	248s.	35.00
21	280.000	90.160	78.500d.	248s.	35.00
22	Holiday	Holiday	78.500d.	248s.	Holiday
23	280.000	90.160	78.500d.	248s.	35.00
24	(e)	(e)	(e)	(e)	35.00
26	280.000	90.160	78.500d.	248s.	35.00
27	280.000	90.160	78.500d.	248s.	35.00
28	280.000	90.160	78.500d.	248s.	35.00
AVERAGES FOR MONTH					
Feb.	280.000	90.160	78.500d.	—	35.00
AVERAGES FOR WEEK					
Feb.					
7	280.000	90.160	—	—	—
14	280.000	90.160	—	—	—
21	280.000	90.160	—	—	—
28	280.000	90.160	—	—	—

Calendar week averages, New York Silver: Feb. 3rd, 90.160; 10th, 90.160; 17th, 90.160; 24th, 90.160.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are for Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are for domestic common lead. Corroding lead commands a premium of 10 points.

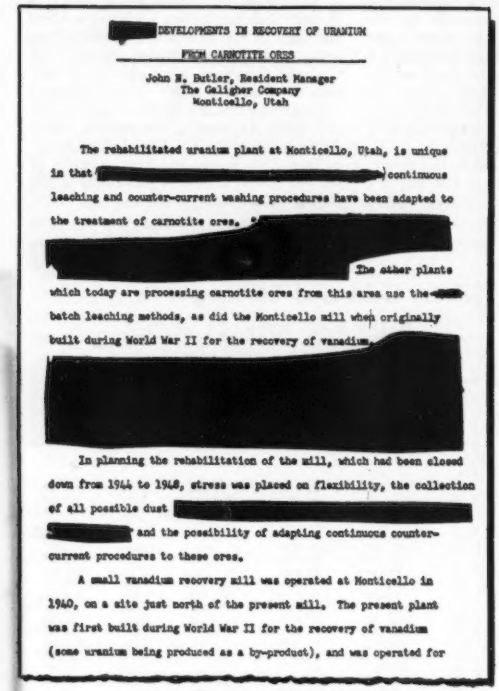
(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fraction of a cent fractions per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen



[redacted] DEVELOPMENTS IN RECOVERY OF URANIUM

FROM CARNOTITE ORES

John H. Butler, Resident Manager
The Calligher Company
Monticello, Utah

The rehabilitated uranium plant at Monticello, Utah, is unique in that [redacted] continuous leaching and counter-current washing procedures have been adapted to the treatment of carnotite ores. [redacted] The other plants which today are processing carnotite ores from this area use the [redacted] batch leaching methods, as did the Monticello mill when originally built during World War II for the recovery of vanadium. [redacted]

In planning the rehabilitation of the mill, which had been closed down from 1944 to 1948, stress was placed on flexibility, the collection of all possible dust [redacted] and the possibility of adapting continuous counter-current procedures to these ores.

A small vanadium recovery mill was operated at Monticello in 1940, on a site just north of the present mill. The present plant was first built during World War II for the recovery of vanadium (some uranium being produced as a by-product), and was operated for

THE AEC EDITS AN ARTICLE
(We're not complaining; we're lucky there's this much left!)

» **Shades of the Solomon Islands!** We haven't seen anything like the above since we tried to tell some friends back home exactly what we thought of the whole Pacific Theatre of Operations back in 1944. So far as we can see, censors haven't improved their technique in 7 years. Actually, what you see above is what happened when we sent the article on the Monticello plant to AEC for approval. The part of the article that the AEC left intact can be found on page 56 and even the post-razor blade version is well worth reading.

The thing that is really intriguing about the above sample of the censor's art is what the first word of the title could have been to cause it to have been so ruthlessly slashed.

» **We hope we're not violating** security regulations (you can't be too careful with uranium) in telling you that this month's cover is the work of Mrs. Mary Wray, daughter of John Butler, author of the Monticello mill article. How do you like it?

» **For the sake of the peace of mind of almost the entire E&MJ staff,** would the person or persons who sent us 5½ lb. of Belgian Congo sandstone all the way from Leopoldville, please tell us what he had in mind. Some of the guesses hazarded are that it is (1) the Lower Belgian Congo Prize for Editorial Merit, (2) a modernistic sculpture of a one-armed doctor looking down his own throat without a mirror, or (3) part of a mine that someone is trying to sell. Whatever the case, if it were 3 lb. lighter or we were 50% stronger, it would make a dandy paperweight.

» **For some time now,** national magazines have been saturated with the psychological or "know yourself" type of articles. These articles carefully explain that you must face facts: the only reason you want to saw your Uncle Charley's leg off 3 in. below the knee is because you were bitten by a three-eyed cat at the age of two. Once you understand that you will no longer wish to amputate. We sometimes get the definite impression that 83.6% of these articles are written by idle psychiatrists looking for a fast buck—as who isn't. This scholarly opinion notwithstanding, smart publishers seem willing to use vast quantities of paper and newsprint on such articles, so this month we decided to jump on the bandwagon for a trial run.

For a start we decided to stick to the fundamentals, the physical facts and not the psychological theories. So here you are; Know Yourself! Every 24 hours—

Your heart beats 103,689 times.
Your blood travels 168,000,000 miles.
You breathe 23,240 times.
You turn in your sleep 25 to 35 times.
You eat 3½ lb. of food.
You speak 4,800 words.
You exercise 7,000,000 brain cells.
Better lie down. You look tired.

» **Dry ice,** the familiar refrigerant of ice cream, may become the railroad fuel of the future. A miniature scale-model "cold-steam" locomotive, driven by the carbon dioxide gas given off by dry ice, was recently demonstrated to railroad fans in Minneapolis. Emil Vollander, of Sacramento, California, who designed and built the engine, believes this type of power may become universal on railroads, because of economic factors.

» **Since this is the month** when Uncle Sam's Internal Revenue agents go through your pockets, we thought you might be interested in seeing where some of the nickels go. On page 68 is the story of the Sydvaranger ("Sonja Henie" spelled sideways) Iron Mine in Norway, which may well be the most modern open-pit mine in Europe thanks to ECA funds. Before long they expect to mine 1¼ million tons of magnetite ore per year, running 30% iron. Incidentally a good part of the operating officials spent anywhere from a few months to a few years looking over large scale open-pit operations in the U. S.

ENGINEERING AND MINING JOURNAL

MARCH, 1951

Proposed Solution on Copper Tariff

THERE IS A WAY, it seems to us, to solve the present controversy over the copper tariff in a fashion that is helpful to both sides, and will avoid deepening an unpleasant rift in the mining industry.

The proponents of tariff protection on copper are not really concerned over imposition of duty while markets are booming and there is clear evidence of need far beyond domestic capacity to produce. They want a duty to protect them against a possible slump in price which might leave them derelict. Despite the boom atmosphere which pervades both the present scene and the outlook, their experience with a price slump as recently as 1949 makes them skittish of any waiver without a price floor.

Consumers, on the other hand, are incensed over being required to pay a duty above a price they regard as high when it is quite evident that imports are needed.

People of the foreign countries whose copper we need in the present emergency—and which we are likely to need during most of the years to come—have a twofold viewpoint. First, they take a dim view of friendship which is proffered for fair weather only. Second, they can get much higher prices for a substantial portion of their tonnage elsewhere, and consider the imposition of a duty as adding insult to injury under the circumstances. They are refusing to bear the burden of the duty, with the result that the consumer is currently paying the domestic price plus the duty for imported copper. They are also threatening to sell less copper here and more in foreign markets.

Diverse as these viewpoints are, it seems to us that the following formula should be acceptable to all as a temporary solution of the problem: A two-year waiver of the duty as long as the domestic price remains at 24 cents or above, the duty to be reimposed at the rate of one-half cent of duty for each cent of drop in price below 24 cents.

From the standpoint of the domestic producer, this provides protection as needed, to the extent that the 2-cent duty can be regarded as protection.

To the consumer, this formula provides duty relief as long as the market is bullish, and a graduated reimposition if conditions change. Consumers who insist on tariff protection for their own products can hardly object to invocation of tariff protection as needed by their suppliers.

To the foreign producing country, this formula provides removal of the tariff barrier under present conditions and a graduated rather than an abrupt reimposition. Countries which use duties to protect their own industries cannot in principle object to use of the same device on our part, particularly when the impost is moderate and gradually applied.

To those who might object that 24 cents is too high a price to consider as a breaking point, we point out that the industry is hemmed in with still inflating costs, and needs all the elbow room possible under the present price to meet these costs.

You Can't Afford to Miss This

IT WILL BE OUR PRIVILEGE to present next month a special article that we regard as a real milestone in E&MJ's 85 years of service to its readers.

This will be an exhaustive presentation of what modern management methods have done for Hollinger Consolidated Gold Mines, Ltd. We are sure you will be deeply interested and find great practical help in studying how the following impressive accomplishments were made in recent years:

Reduction in absenteeism 50%
Labor turnover reduced 50%
Reduction in accident rate 40%
Tons per man-shift on production, up....17%
Incentive-wage earnings per shift, up..$1.90
Labor cost savings per ton 27%
(Despite a 42% increase per shift)

These accomplishments do not in any sense portray a freak situation. They are the result of courageous, comprehensive, consistent application of management practices and policies which are generally recognized as progressive. Here is a case history which, if intelligently applied to your own problems, is worth thousands of dollars to your operation. Watch for it in our April issue.

COLORADO PLATEAU CARNOTITE is leached successfully in this new plant at Monticello, run by the Galigher Co. for the AEC. Continuous leaching with soda ash, developed here, replaces inefficient batch leaching technique.

Utah's New Uranium Mill

How A Continuous Leaching Technique Is Increasing Uranium Production

JOHN A. BUTLER

Formerly Resident Manager

The Galigher Co., Monticello, Utah

THE URANIUM PLANT at Monticello, Utah, is unique in that continuous leaching and counter-current washing procedures have been adapted to the treatment of carnotite ores. The other plants which today are processing carnotite ores from this area use batch leaching methods, as did the Monticello mill when originally built during World War II for the recovery of vanadium.

In planning the rehabilitation of the mill, which had been closed down from 1944 to 1948, stress was placed on flexibility, the collection of all possible dust, and the possibility of adapting continuous counter-current procedures to carnotite ores.

The present plant was first built during World War II for the recovery of vanadium (some uranium being produced as a by-product), and was operated from 1942 to 1944 for Metals Reserve Co. by the Vanadium Corporation of America. The process at that time was similar to that of other plants in the area. It involved a salt roast followed by batch sand leaching of the quenched calcine in filter-bottom tanks.

With the initiation of the Colorado Plateau uranium ore procurement program in 1948, the Monticello plant was taken over by the Atomic Energy Commission. The sampling plant was rebuilt and dust

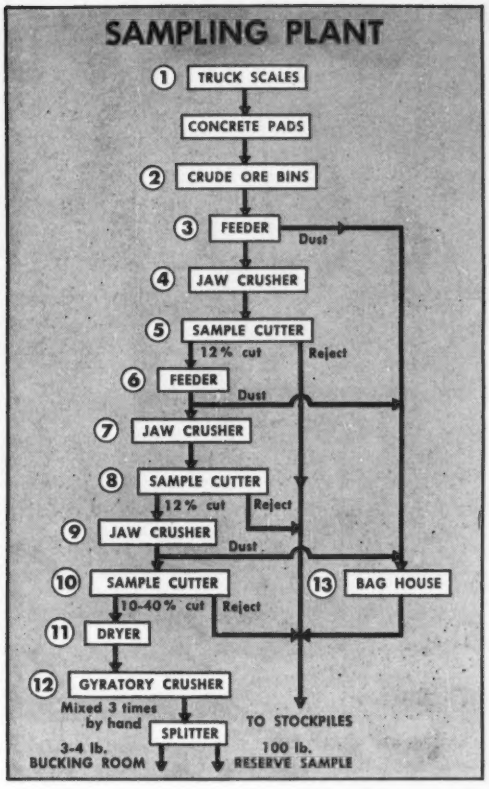
How The Process Works

DESIGNED TO TREAT 100 tons daily of Colorado Plateau carnotite ore, the Monticello mill now exceeds rated capacity.

In essence, the mill uses a process resembling counter-current cyanidation. It is, however, the first time continuous leaching has been applied to carnotite ores. These are the steps:

1. **Crushing stockpiled ore to minus 10 mesh.**
2. **Roasting ore with salt.**
3. **Quenching calcine in hot Na_2Co_3 solution.**
4. **Grinding to 65 mesh.**
5. **Agitation leaching in 7 to 9% Na_2CO_3 solution.**
6. **Counter-current washing and filtration.**
7. **Precipitation of uranium and vanadium by H_2SO_4.**
8. **Purification of U_3O_8 and V_2O_5 by fusion and leaching.**

Mr. Butler, who was resident manager at Monticello while this process was being worked out, gives details on all these steps in his article and its four flowsheets. The Monticello mill is not only the first to use this process, it is the outstanding U. S. example of modern large-scale uranium recovery practice.



SMALL MINES supply ore. These lots await sampling.

LEGEND

1. Howe truck scales, 20-ton cap., and Fairbanks-Morse scales, 50-ton cap.
2. Cone-bottom steel bin, 6x8-ft., 15-ton.
3. Reciprocating plate feeder.
4. Austin-Western jaw crusher, 15x24-in., 2-in. discharge.
5. Vezin sampler, 30-in. diam., 1 cutter.
6. Reciprocating pan feeder.
7. Telsmith jaw crusher, 10x20-in., ¾-in. discharge.
8. Vezin sampler, 30-in. diam., 1—2 cutters.
9. Rogers Ironworks jaw crusher, 7x10-in., ⅜-in. discharge.
10. Vezin sampler, 30-in. diam., 1—4 cutters.
11. Rotary dryer, 42x30-in. gas-fired.
12. McFarlane-Eggers-Englebach gyratory crusher.
13. American Wheelabrator dustube dust collector, 48 bags, each 90 in. long x 5-in. diam.

collection equipment installed. In August, 1948, the American Smelting and Refining Co., as purchasing and sampling agent for the AEC, started buying and stockpiling ores.

The processing plant had deteriorated rapidly after being shut down in 1944, and with the exception of the existing buildings and the power plant, the mill had to be entirely rebuilt. The Galigher Co. of Salt Lake City was engaged by the AEC, in October, 1948, to redesign the plant. Construction of the new mill began about one month later. Simultaneously with the design of the new plant, the U. S. Bureau of Mines in Salt Lake City carried out extensive tests to determine the best procedures for treating the several types of ores which were then being stockpiled at Monticello. At the same time, tests were conducted to determine the feasibility of using all-slime counter - current procedures for treatment of these ores. In September, 1949, when the mill was ready to go into operation, The Galigher Co. was employed by the AEC, to operate the mill.

Since September, 1949, the plant operated for two months on a raw ore leach and for 12 months on the treatment of low vanadium and asphaltic ores by a low temperature roast followed by hot sodium carbonate leaching. At the present time the plant is treating high vanadium low lime ores by the salt roast method.

The Monticello mill consists of two separate operations: 1, buying, sampling and stockpiling of ores by the American Smelting and Refining Co.; 2, processing of ores from these stockpiles by The Galigher Co.

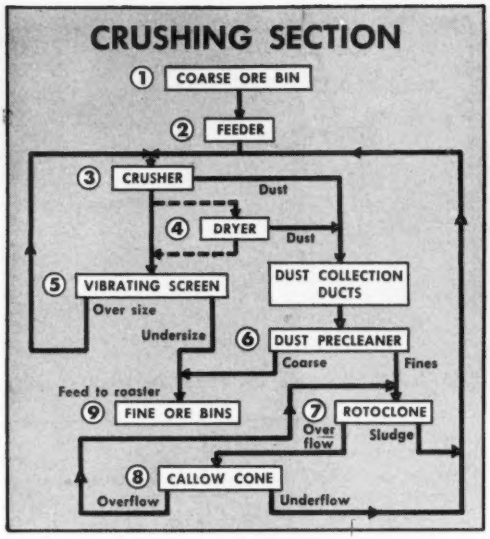
Sampling Plant

Shipments of ore are delivered by truck, where they are received by the American Smelting and Refining Co., weighed on truck scales, and then unloaded on concrete receiving pads. Each load is then immediately hand-sampled for moisture content. As each individual shipper brings in successive loads, these are combined into lots. Each lot is closed on a specified lot size and the entire lot is then put through the sampling plant. (See flow sheet.) The size of lots varies from a minimum of ten tons up to 50 tons or more.

Size of ore, as delivered to the sampling plant, is from a maximum of 12 in. down to fines. Each lot of ore is loaded on trucks at the receiving pads and hauled to the coarse ore bin of the sampling plant. Each sampler cuts 12% or more of the ore fed to it, all rejects going to a bin, from which ore is loaded in trucks and taken to the appropriate stockpile. Ores, stockpiled according to type, were originally classified as:

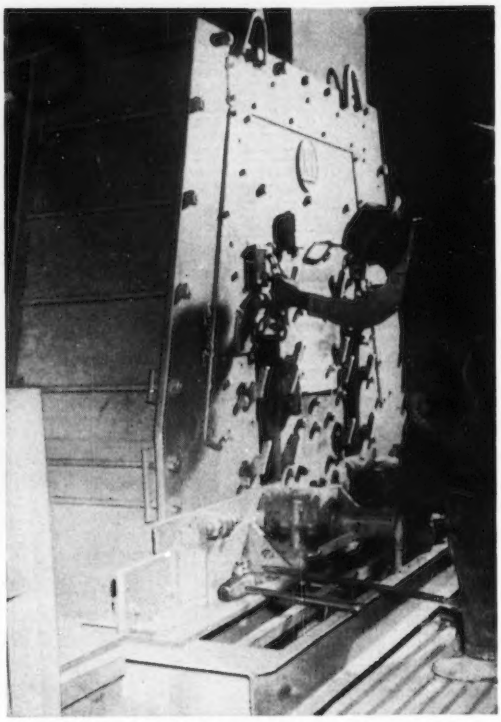
1. Low vanadium-low lime
2. Low vanadium-high lime
3. Asphaltic or Temple Mountain
4. High vanadium-low lime
5. High vanadium-high lime

Because we can now treat the first three types simultaneously in the plant, these are being stockpiled together.



LEGEND

1. Wood bin, 12x18x13 ft., cap., 130 tons.
2. Armored belt feeder, 36-in. wide, 8 ft. 6 in. long.
3. Dual-Impact breaker, 20x20-in.
4. Rotary kiln drier, 5x40-ft., oil-fired.
   Robins Eliptex screen, 60x124-in.; lower screen openings, 0.1875 in.; upper scalping screen openings, 0.78 in. wide, 1¼ in. long.
6. No. 27 Skimmer precleaner, 9x4 ft., star feeder discharge.
7. No. 16, Type N Rotoclone, with sludge ejector.
8. Steel desliming cone, 6x8 ft.
9. Wood bin 15x15x28 ft. deep, and wooden tank, 16 ft. diam., 14 ft. high, total capacity, 370 tons minus 10-mesh material.



DANGER OF DUST LOSS is high, so plant uses Cedarapids breaker to minimize fines in 10-mesh crushing.

Crushing Section

In the design of the crushing section, weight had to be given to the fact that the fine dust in the ore carries values 4 to 7 times as high in uranium and vanadium as the run of ore, and that in crushing to minus 10-mesh the production of excessive amounts of fine dust would be undesirable for a roaster feed. For the above reasons, extensive dust collection apparatus was installed in the crushing section, and the crusher selected was a 20x20 Cedarapids double-impeller, impact breaker. This crusher is relatively new to Western operations but was selected because of its ability to crush to minus 10-mesh.

Drier Rarely Needed

Screen analyses of products in the crushing plant circuit are as follows (feed to crusher 2 in. maximum):

	Weight %		
	Crusher Discharge	Screen Oversize	Finished Product
+½ in.	3.7	7.4	—
−½ in.+¼ in.	8.0	15.0	—
−¼ in.+ 10-M	34.4	69.3	2.3
−10-M+ 14-M	4.0	3.0	6.2
−14-M+ 28-M	6.1	0.5	11.8
−28-M+ 48-M	13.2	0.3	20.9
−48-M+ 65-M	8.6	0.4	19.8
−65-M+100-M	5.7	0.3	10.5
−100-M+200-M	8.0	0.8	12.6
−200-M	8.3	3.0	15.9

The screen analyses reported above were made when the dryer was in operation. The amount of minus 10-mesh material returned to the crusher will vary considerably with the moisture content of the ore since steam formed in drying causes some of the dust to adhere to the surface of the coarser particles.

The 5x40-ft. drier is operated only when the ore becomes too wet to be screened efficiently. During periods of dry weather the drier has been in operation as little as three hours in an entire month.

Installed dust collection equipment consists of suction ducts over each ore transfer point, at the crusher and at the drier. The dust is first passed through a precleaner dust chamber, where coarse dust is dropped out onto the minus 10-mesh conveyor belt. The remaining fine dust is drawn into a No. 16 Type N Rotoclone, the sludge produced being returned directly to the circuit.

A Rotoclone is so constructed that a small flow of water must be entering it at all times while operating in order to guarantee against break-through and loss of dust. This water commonly overflows to waste. Shortly after start of operation of the crushing plant Rotoclone, tests showed that although the bleed-off to keep a constant water level was small, fine dust particles carried in this overflow carried appreciable values in uranium and vanadium. A 6-ft. Callow cone was therefore installed in a closed circuit with the Rotoclone overflow.

Evaporation of water from the Rotoclone normally balances the make-up water plus moisture in the

ore. At such times as the ore is sufficiently wet that there is a gain of water in the Rotoclone, overflow of the Callow cone is run to waste. This overflow is normally clear, but if slimes do overflow, small additions of starch are used to aid settling.

The crushing plant is operated one shift per day for 6 days a week. Actual operating time is 6 to 6½ hr. per shift, the remaining 1 to 1½ hr. of the shift being used on clean-up, oiling and light maintenance work. The total capacity of the fine ore bins is sufficient to keep the plant operating for three days.

Roasting and Leaching Section

The roasting and leaching circuit is designed to treat the different types of ores being received at Monticello. Treatment of the two main types of ores, the high vanadium-low lime and the low vanadium-asphaltic types, differs only in the temperature of the roast, addition of salt, and strength of sodium carbonate solution.

Ore feed to the roaster passes over the weightometer, is sampled, and then is elevated to the top hearth of an 8-hearth, 18-ft. diameter Skinner roaster. From this point the two types of ores are treated differently. The two ore types will be classified as follows:

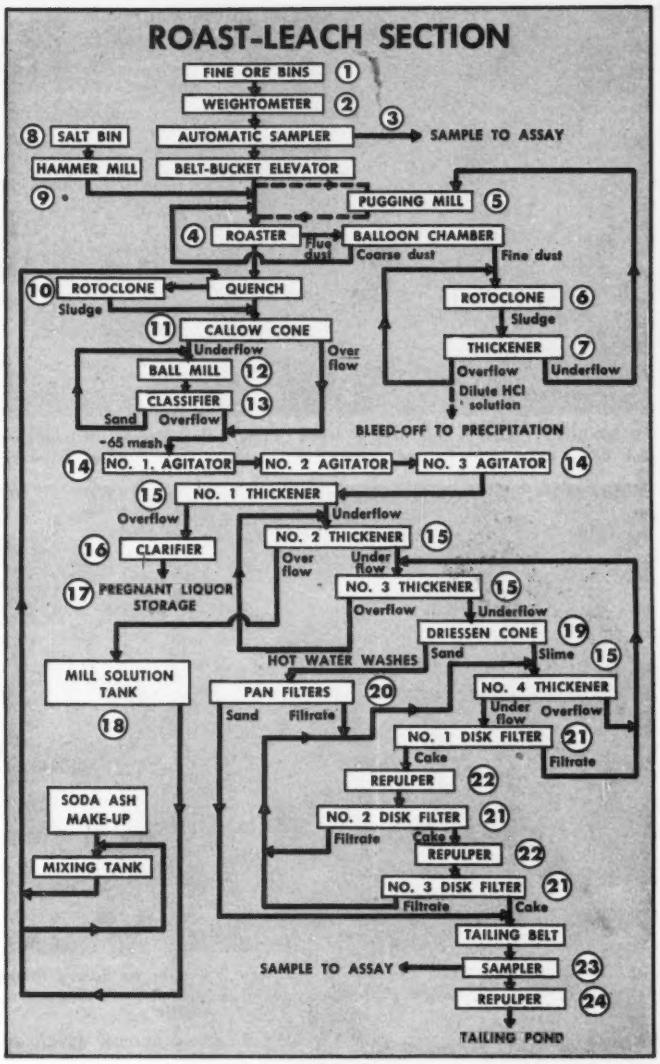
Type I—Ores roasted with salt at 850° C.

Type II—Ores roasted at low temperature without salt.

Type I Ores

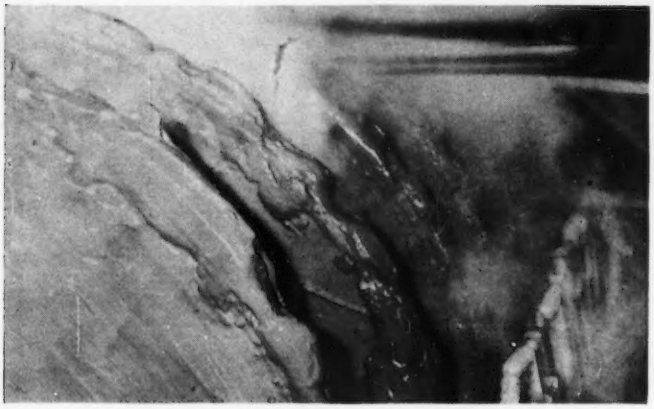
Since November, 1950, the plant has been treating the Type I high vanadium-low lime ores. These have a lime content of less than 2.0%. These ores are treated by mixing with 6 to 9% salt by weight, roasting at 850° C., and quenching in 3% hot sodium carbonate solution. After quenching, the calcine is ground to natural grain size (approximately 65-mesh) and uranium and vanadium are dissolved by agitation leaching. The pulp is kept at 92° to 96° C. in the agitators by steam coils. Extractions of 93% of the uranium and 85% of the vanadium are obtained.

After roasting, this type of ore settles very rapidly and contains practically no slimes. It has been found most important to quench the calcine immediately upon discharge from the roaster in order to

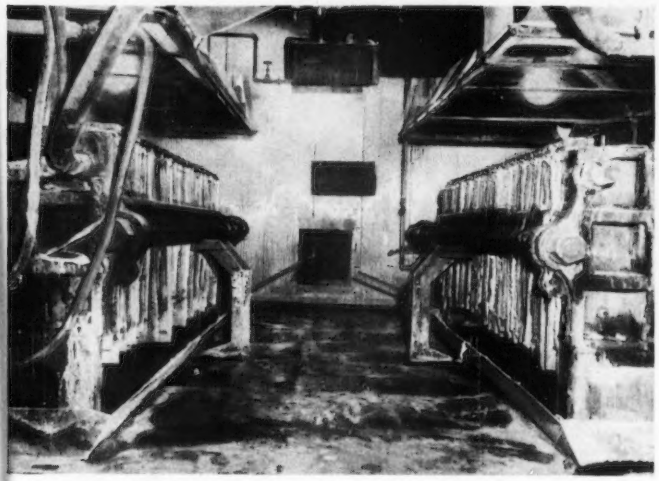


LEGEND

1. Wood bin, and tank, 370 tons.
2. Merrick weightometer.
3. Geary-Jennings sampler, 10-min. intervals.
4. Skinner roaster, 18-ft. diam., 8-hearth.
5. Mace pugging mill, 14 ft. diam.
6. No. 16, Type N Rotoclone, rubber-lined.
7. Thickener, wood tank, rubber-covered mechanism, 12x8-ft.
8. Wood bin, 120-ton cap.
9. American, Type 30, 30x16-in. hammermill.
10. No. 2½, Type N Rotoclone, sludge ejector.
11. Cone with overflow rim, 30-in. diam.
12. Eimco ball mill, 5x6 ft.
13. Akins classifier, 48-in.
14. Three Galigher Co. agitators, steel tanks, 10x10-ft.
15. Four Morse Brothers thickeners, steel tanks, 30x8-ft.
16. Five rows of socks, 6 socks per row, each sock 5 in. diam., 6 ft. long.
17. Two steel tanks 16x16 ft.
18. One steel tank, 16x16 ft.
19. Two cones made from 6-in. pipe, adjustable orifices.
20. Two Oliver horizontal filters, scroll discharge, 11 ft., 6 in. diam.
21. Three 6-disk, 6-ft. diam., Peterson filters.
22. Two steam repulpers.
23. Geco sampler, 10-min. intervals.
24. Steel agitator, 3-ft. diam., 5 ft. deep.



THIS SLIMY CAKE is fine part of leach tailing, being filtered on Peterson disk filter. Cake is blown and repulped with steam, then pumped to pond.



URANIUM PRECIPITATE from leach solutions is caught on Sperry filter presses. Corrosive filtrate and cake require stainless steel floor in this room.

obtain high uranium and vanadium extractions. Cooling of the calcine over a period of one minute or more through the temperature 850° to 750° will result in 10 to 15% lower extractions of uranium. Vanadium extraction is also lowered. Therefore the calcine is discharged from the roaster by a short shaking feeder directly into high-pressure solution jets and is then carried through pipes to the ball mill-classifier circuit.

Grinding need only separate the natural sand grains, since the carnotite is carried in the cementing material around the grains. Maximum size of balls in the mill is 1½ in., with a light ball load for attrition grinding to approximately minus 65-mesh.

Because of the absence of slimes and the settling rate of 26 fpm. of these sand grains, over-size propellers had to be installed in the agitators to hold this material in suspension. In the design of the plant, transfer of pulp between thickeners could not be handled by diaphragm pumps. Thickened pulp discharges through an adjustable orifice into a Wilfley sand pump, and is then pumped to the next thickener. To prevent sanding of pipes, it is necessary to keep the pulp moving at a high velocity.

Salt-roasted material is filtered on one of two 11 ft. 6-in. diameter Oliver horizontal filters. Because of the fast filtering of this material it is possible to get four washes on the filter cake.

Type II Ores

The largest tonnage of ores which are not amenable to the salt roast procedure are the asphaltic base ores, commonly called "Temple Mountain" ores. Lesser amounts of low vanadium-low lime and low vanadium-high lime ores are mixed with these for treatment in the mill.

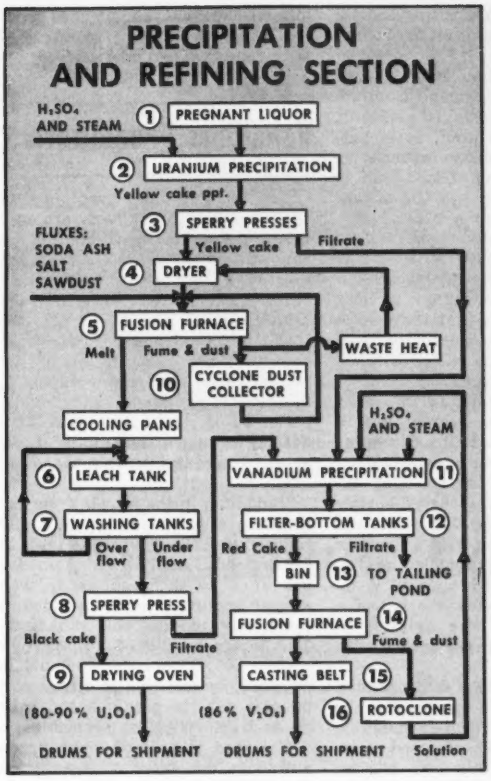
The vanadium content of these ores is low and only 35 to 40% of the vanadium contained in the ore is leached by any normal plant methods. It has been possible, however, during 12 months of operation at the low temperature (550° C.) roast as practiced in the Monticello mill to obtain extraction of 80 to 85% of the uranium from the asphaltic type ores. It has been found necessary to keep the leach solutions at a concentration of from 7 to 9% sodium carbonate in order to obtain good extraction of the uranium.

In the first months of operation on these ores, difficulties were encountered due to "fouling" of the carbonate leach solution. At that time the calcines were quenched at a pulp density of 25 to 30% solids. Sufficient solution was taken from No. 1 thickener overflow to precipitation each day to hold the pregnant liquor just below 2.00 grams of U_3O_8 per liter. If the concentration was allowed to increase above this, reprecipitation of uranium occurred in the leach and washing circuits.

Thick Pulp Is Cleaner

Although laboratory tests indicated a lower tailing loss when leaching at 25% solids, experience in operation has shown the necessity of quenching and leaching at 45 to 50% solids. By this procedure, salts other than those of uranium and vanadium which dissolve and build up to "foul" the leach circuit are kept to a minimum, since a larger proportion of the solution high in such salts is bled from the leach circuit to precipitation each day. By this procedure the "fouling" of the leach circuit has been prevented and fresher, more active sodium carbonate solution is in contact with the calcine when quenched and leached.

The low vanadium and asphaltic type ores have in common the characteristic that they are sandstones composed of sand grains, of approximately 65-mesh, and cementing material, which is a true primary slime. In the thickening and filtering of these ores, the pulps do not act as do the pulps in an all-slime



LEGEND

1. Two steel tanks, 16x16-ft.
2. Two rubber-lined agitators, 12x12-ft.
3. Four wood-frame Sperry filter presses, 36x36-in.
4. Brick flue from furnace with cast iron top plates.
5. Tilting-hearth, reverberatory-type furnace, oil-fired.
6. Galigher Co. agitator, 6x6-ft.
7. Three Galigher Co., agitators, cone bottom, 10x10-ft.
8. One iron-frame Sperry filter press, 36x36-in.
9. Multiple-pan steam drying oven, 7x8-ft.
10. Cyclone dust collector, 5 ft. diam.
11. Four rubber-lined agitators, 8x8-ft.
12. Two rectangular rubber-lined tanks, 6x15-ft.
13. Wood bin, 55x30x15-ft., cap. 15 days' production of red cake.
14. Sloping-hearth reverberatory furnace, water-jacketed bottom.
15. Straight-line caster, 4x8-in. steel sections mounted on roller chains.
16. No. 12, Type N Rotoclone.

YELLOW CAKE (sodium uranyl vanadate) dries on flue from fusion furnace. This runs about 45% U_3O_8, 17% V_2O_5.

BLACK CAKE (uranium oxide) fuses in special furnace, is tapped as above, is water-leached to pure black U_3O_8.

cyanide circuit. Sands separate rapidly from the slimes, and while they can be thickened as a combined pulp, the two fractions have to be filtered separately. It is not possible to maintain a reasonably constant depth of clear solution in the thickeners because of this sand-slime separation, but from operating experience it has become possible to keep clear overflows on all thickeners. The depth of clear solution has to be maintained at 18 to 24 in.

A sand-slime separation is obtained ahead of the filters by pumping the underflow of No. 3 thickener through one of two "Driessen" cones. In the operation of these cones, it is necessary to obtain a sand fraction free from slimes, while fine sand in the slime fraction improves filtering of the slimes. Sands are filtered on one of the two Oliver horizontal filters, while the slimes are thickened and pumped to three 6-ft. diameter, 6-disk

Peterson filters operating in series.

Operating conditions of the "Driessen" cones are therefore quite different from those reported recently in the literature. Average pulp densities are as follows:

Feed	41% solids
Slime discharge	15% solids
Sand discharge	70% solids

Screen analyses show the following sand-slime separation:

	Feed	Slime Discharge (20% of tonnage)	Sand Discharge (80% of tonnage)
+100-mesh	55.5	14.7	65.5
+200-mesh	25.8	30.9	24.6
−200-mesh	18.7	54.4	9.9

Although the sand discharge from the cones contains approximately 10% of minus 200-mesh material, 90% of this is fine sand and a clean, slime-free product is obtained for the horizontal filters.

Sand and slime tailings, which average 18% moisture are combined, repulped in water or waste liquor from precipitation and pumped to a tailing pond.

Uranium Precipitation

Uranium is precipitated as a "yellow cake" (sodium uranyl vanadate) from the pregnant liquor by addition of sulphuric acid. Liquor is pumped from storage tanks to two 12x12-ft. rubber-lined agitators. These have a rectangular beam attached to the end of the shaft for agitation and operate at 19 rpm. Concentrated sulphuric acid is added to the sodium carbonate liquor to a pH of 6 and the solution is heated by live steam injection until all CO_2 has been expelled. The pH is further adjusted by additions of acid; heating and agitation are continued until the filtrate shows 10 parts or less of U_3O_8 per million. The precipitation operator checks the filtrate for completeness of precipitation by means of a bead test which takes about 10 min.

The yellow precipitate is filtered from the solution by pumping through 36x36-in. Sperry presses. Filtrate from the presses goes to the vanadium precipitation. Yellow cake cleaned from the presses, which contains up to 70% moisture and assays 45% U_3O_8 and 17% V_2O_5 (dry basis), is dried to about 10% moisture by spreading on cast iron plates which cover the top of the flue from the fusion furnace. It is then mixed with fluxes, which consist of soda ash, salt and sawdust, and fused in a tilting-hearth, reverberatory type, oil-fired furnace.

This furnace which is the first of its type in use for fusing uranium yellow cake was designed and built by the Monticello staff. It is patterned after cupelling furnaces as used in the refining of gold bullion. The tilting hearth has the advantage that no tapping is necessary. When a charge is fused and is quiescent, the hearth is tilted forward by means of a hydraulic cylinder. Another advantage of this type of furnace is that the hearth can be lowered and moved out from under the arch on a truck when repairs have to be made.

The arch is built of fire clay brick, while the hearth has a rammed magnesite lining. No water jacketing or cooling is necessary.

The melt from the reducing fusion is poured into curved-bottom pans, 4½ ft. long by 4 ft. wide, and when cool is broken with a hammer into pieces 4 in. or smaller in size. These are charged onto a ⅛-in. screen set 2 ft. below the top of a 6x6-ft. agitator. The agitator is filled to 6 in. above the screen with warm water.

Vanadium in this fused material is readily soluble in water; the uranium is in the form of insoluble oxides. The chunks of fused material dissolve rapidly and become sufficiently fine to pass through the screen. The pulp is pumped to 10x10-ft. Galigher Co. agitators which overflow back to the 6x6-ft. agitator. This leaching dissolves the vanadium while the uranium becomes a very fine black powder.

When titrations show that the liquor contains approximately 25 grams of V_2O_5 per liter, pumping from the 6x6-ft. agitator is stopped. Agitation in the 10x10-ft. agitator is also stopped and the uranium oxide is allowed to settle. The vanadium liquor is siphoned off and is pumped through a 36x36-in. iron-frame-and-plate Sperry press.

Thickened uranium oxide pulp in the 10x10-ft. agitator is given two warm water decantation washes; these washes are used for subsequent leaching of fused yellow cake. After decantation of the second wash, the thickened black uranium oxide pulp is pumped to the Sperry press.

Black cake in the press is blown first with steam, then with air before cleaning the press. Black cake from the press is placed in pans and dried to 0.10 to 0.20% moisture in a steam-heated drying oven. It is then packaged in drums for shipment to the AEC. The finished product contains a high percent of U_3O_8 and a fractional percent of V_2O_5.

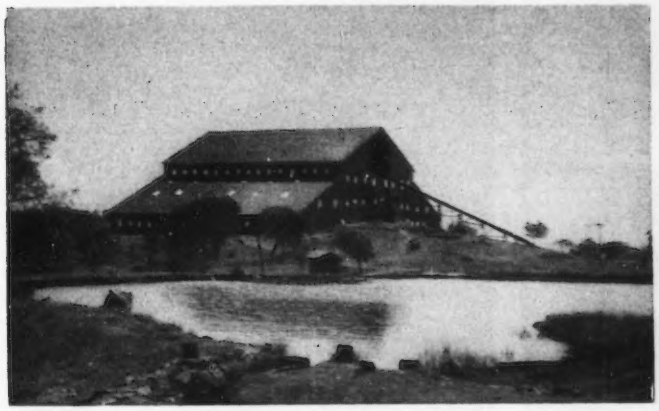
Vanadium Precipitation

The filtrates from uranium precipitation and those from uranium refining have to be treated somewhat differently. These filtrates are precipitated in 8x8-ft. rubber-lined agitators (similar to those used for uranium precipitation) by pH control. Vanadium in the filtrate from the uranium precipitation is already oxidized and requires only the addition of sulphuric acid until a pH of 2.5 is reached, together with heating to approximately 80° C. to obtain a readily filterable vanadium oxide red cake.

Vanadium in the filtrate from the uranium refining section is highly reduced and the solution is high in caustic soda. Acid is added until a pH of 2 to 3 is obtained, then enough sodium chlorate is added to completely oxidize the vanadium. The liquor is heated to approximately 80° C. and the final pH is adjusted, by addition of either acid or soda ash, to obtain a red cake of desirable physical properties.

This red cake is of lower grade and does not filter as readily as that obtained from filtrate from uranium precipitation. These solutions which contain 20 to 25 grams of V_2O_5 per liter are precipitated to 0.25 grams or less of V_2O_5 per liter. Red cake (vanadium oxide) is filtered from the solution in rectangular, rubber-lined filter bottom tanks. After washing with hot ammonium sulphate solution and hot water, the red cake is shoveled into a wood bin, which has sufficient capacity to store red cake for 15 days if nceessary.

The wet red cake, which contains 60 to 70% moisture, is slushed to the back end of a reverberatory type furnace, 8 ft. wide by 11 ft. long (outside dimensions). The bottom of this furnace consists of a water-jacketed sloping steel hearth and the sides and arch are made of fireclay brick. There is no back in the furnace, this being formed by the wet red cake being piled up at that end. An Airoil burner plays directly on the pile of wet red cake in the furnace and as this dries and fuses it flows continuously onto a straight-line caster. From the caster the flake vanadium oxide is dropped directly into drums ready for shipment.



TYPICAL of former days on the Mother Lode—the 120-stamp mill of Royal Consolidated Mining Co. as it looked in 1932.

THE ORE never really played out in the Kennedy, even at great depth.

The Mother Lode Is Not Dead

Will the great mineralized zones ever be worked out? They seem to go on and on. Here is a man who knew California's great Mother Lode well in its heyday, who says it will come back. We think you will agree, and will make interesting comparisons with other camps within your own experience.

The Editors

D. C. DEMAREST

THE AUTHOR knows that fiat money will breed its own destruction.

IN LONG STRETCHES of the Mother Lode country, where once its surface was dotted over with busy mine hoists and mills, there is today not a wheel turning nor a single miner at work. In comparison with its glorious past, this once world-famous gold field presents a gloomy picture.

I recall that period of my life when this land of gold was my stamping ground—beginning back in the 1870's. For a good part of the 50 years that I spent in this "God's country" my business travels took me frequently over the mining ground of Amador, Calaveras and Tuolumne counties, known then as "the heart of the Mother Lode". At that time, this section of the State was humming with activity and was in fact, the brightest spot in point of industry and prosperity in all of California. During this era of gold lode mining, which reached its peak in the late 1890's, the populations of towns all along the line, such as Angels Camp, had swollen to their numbers of the exciting days of the Gold Rush. There was "hustle and bustle" everywhere.

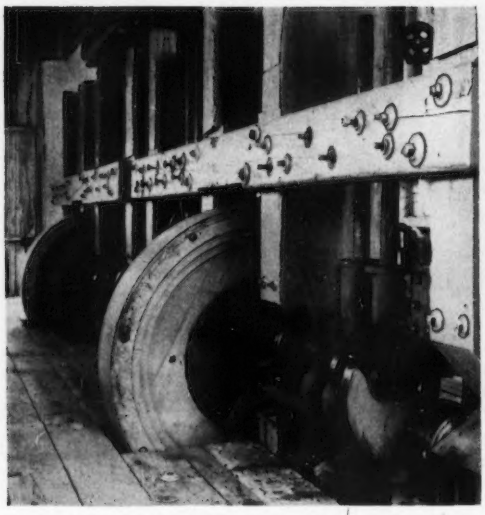
High prices of labor and materials, combined in recent years with the inadequate price of gold, held down by Government decree, are responsible for the change that has taken place in this area. Under conditions that now prevail, gold cannot be produced here at a profit—with rare exceptions. It is no wonder that some people are of the opinion that the Mother Lode is "done for". Basing my reasons upon my knowledge of ore conditions in dozens of Mother Lode properties, gained when the Lode was "open" and its mines were working full blast, I have a firm belief that this great gold belt will come back to life.

Gold Will Come Back

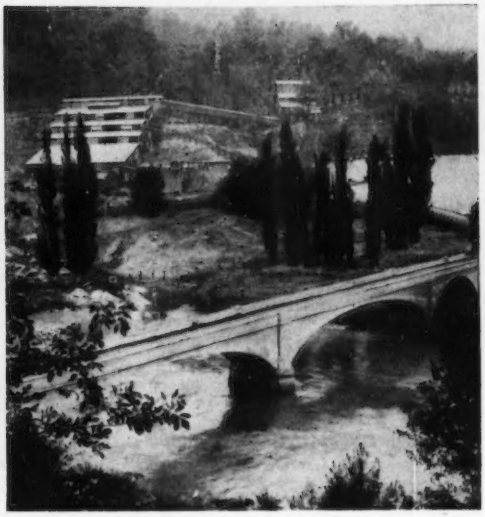
Operating costs will never get back to the levels of former days. The factor that will give the gold miner a chance to profit is an adequate price for his product. I believe that the realization of such a price is inevitable. Gold will be freed from its present shackles when our money manipulators will have wrecked the integrity of the currency and will be forced to reorganize it on a trustworthy basis. When this happens, gold will be revalued at a price in consonance with production costs.

In foisting upon us a substitute for sound money, the politicians and economists have been favored in the maintenance of its face value by the continued extra high credit rating of the United States, which is due in part to our possession of the largest national stock of gold in the world.

My further belief is that, be-



THOUSANDS OF STAMPS, like these in the Central Eureka, at Sutter Creek, ground the Mother Lode's ores.



FIRE DESTROYED this modern plant at Carson Hill in 1943 but there is still gold in the ground.

cause of the great increase in world population and world business volume, the future need for gold will be so urgent that its production will be encouraged. I expect the day to come when a price will be paid for gold that will make payable the ores of numbers of deposits on the Mother Lode that were abandoned when they could not be worked at a profit. As one example, I would cite the case of the Dutch-App mine in Tuolumne County. The last work on this property was done by W. J. Loring, a prominent and widely known figure in the mining world. Loring had developed a block of ore in the lower levels that contained about a million tons, having a net value then of $1,250,000. When this ore was about to be stoped and milled, increased costs wiped out the profit margin, and so closed the mine down.

When a higher price for gold does come, there will then be an incentive for renewed exploration along the whole Lode. Venture capital will be available when it becomes apparent that gold mining is again a field for rich prizes.

Values Are Variable

The Mother Lode ore supplies of the future will come, not only from the source above mentioned, but from other sources to be found by exploration. There is no doubt in my mind that great potential wealth lies in the unexplored depths of the abandoned mines, especially those that had a good gold production. My opinion in this respect is based upon a characteristic of Mother Lode ore deposits that was found to be common in practically all of the mines that were worked to any considerable depth. From the surface croppings down, there were mine levels that yielded a better grade of ore and then there were other levels with a poorer grade of ore. Zones were encountered called "barren zones" that were rather zones of ore that were non-payable under conditions then existing.

At the peak of activity on the Lode, there were but few mines that carried cash reserves for a rainy day. This fact accounted for the shutdowns of some properties that might have had a longer life. Money was lacking at a critical time, when further exploration might have opened up lower levels with payable ore.

Several early-day mining companines "went broke" on the Kennedy mine, one of the most noted mines on the Mother Lode, in their operation of the mine, down to about the 1,000-ft. level. Around 1885, when F. F. Thomas, one of the best miners in Mother Lode history, took over the Kennedy, its deepest level was in a "barren zone". Thomas at once deepened the shaft by several hundred feet and came into ore with good values restored. From then on, the Kennedy was a profitable producer, continuing so for over 40 years. Before its last shutdown, this mine had reached a depth (vertical) of close to 6,000 ft.

In the late 1880's, Alvinza Hayward, the most noted of the early-day Mother Lode miners, closed down his Empire-Pacific mine at Plymouth, in Amador County, after realizing large profits from its operation to a depth of 1,700 ft. The geology of the Lode was not understood then as it was some years later, and when Hayward found the ore on the 1,700-ft. level to be too low-grade to be worked profitably, he concluded that the mine had "petered out", and abandoned it.

Perseverance Won

About 25 years later, W. J. Loring unwatered this property and developed ore in its deeper levels that paid his company dividends of $20,000 monthly, over a long period of time. I believe that under Loring's management, this mine yielded over $8,000,000, at the old price of gold.

After Loring had cleaned out the old Hayward workings, he described to me the situation in the bottom, as he had found it. Hayward's management had put down a winze on the 1,700 to a depth of 75 ft., which apparently had confirmed their belief that the payable ore had quit. In his examination of this winze, Loring found that Hayward's samplers had failed to test the last "round" in the winze—within 4 ft. of the bottom. Loring's samples showed

that the ore values had returned. Hayward had shut down the Empire-Pacific, without knowing that he had passed the "barren zone".

The Rawhide mine in Tuolumne County furnished one of the best examples on the Lode of good and poor zones of ore alternating in the downward development of the orebody. It was my good fortune to have had close business relations with Captain Nevills, one of the cleverest of the old-time mining men, who was responsible for the success of the Rawhide. I had access to the mine workings during all of the mine's profitable years. The best ore in the Rawhide was found on the 500, 700, 1,000, 1,200 and 1,500-ft. levels. The 1,000-ft. level was the best one—here I saw a stope face measuring 30 ft. across the vein, that averaged one-and-one-half ounces of gold to the ton of ore. In between these extra good levels, the ore ranged from low-grade to medium-grade in value. At the bottom of the workings, 1,800 ft. below the croppings, the ore was so low-grade as to be unprofitable at the time. One of the last acts of the Captain's life was to sink a winze 40 ft. deep, on the 1,800 level, the sampling of which showed improved values. He was firm in his belief, based upon the ore behavior from the surface down, that additional depth in the mine would repeat the history of the levels above. Unfortunately, the Captain's time was cut short—before his contemplated venture could be started.

The Stickle Bonanza

The main south shaft of the Rawhide did not encounter ore of an attractive grade until it had reached the 500-ft. level. In the Stickle mine at Angels Camp, which Nevills had sold to Charley Lane just prior to his purchase of the Rawhide mine, the ore in the bottom level (about 650 ft. below the surface) was "nothing to boast about", and was an influence in the sale of this property to Lane. The high-grade ore in the Stickle, the so-called "bonanza orebody", was found by Charley Lane in the deeper levels, below the Nevills' workings. In reviewing his experiences on these two properties, Nevills remarked to me a number of times that, if he ever started another Mother Lode property that had the earmarks of a mine, he would not cut a station above the 500-ft. level. His idea was that the 500-ft. shaft would take him through the upper "barren zone", if there was one, into ground where the values were good or were coming back.

The so-called "bonanza orebody" just referred to, was a very rich ore deposit lying below the 1,000-ft. level in the Stickle ground of the Utica mine at Angels Camp. It yielded millions of dollars in gold to its owners, Hayward, Hobart and Lane (the Utica Mining Co.) during the 1890's, and made the Utica mine famous the world over. On about the 1,400 or the 1,500-ft. level, this ore, that had an average value of an ounce of gold to the ton of ore over a vein width of 120 ft., came to an abrupt ending. A fruitless search for its continuation was conducted for some years after, when the Utica properties were closed down.

We met defeat in our own property, the Demarest mine, situated about 6 miles west from Angels Camp, because of the "lean and fat" nature of the ore zones of this Mother Lode country. At the 500-ft. level, the values in the ore had all but disappeared. At the 600-ft. level, the ore conditions were much improved. A winze sunk on this level showed unmistakable signs of the beginning of a payable zone. But by this time, our treasury was empty and we had to turn our backs on a good prospect that might have become a Mother Lode dividend payer.

The cases just cited, a few of a good number that came under my observation, furnish proof that on the main Mother Lode, whose ore channel has never been bottomed, the once productive abandoned mines are not "worked out."

Two mines on the Lode, the Kennedy and the Argonaut, were worked profitably almost to the 6,000-ft. levels. There are no indications at the bottoms of these mines that the ore will quit with increased depth—and some day, if economic conditions are right, these properties may be worked to the 10,000 or 12,000-ft. levels. In the whole length of the Mother Lode, not more than four other mines have been opened below the 2,500-ft. levels. Judging from the history of the Kennedy and the Argonaut, it is reasonable to believe that a lot of ground in the deeper mines is worthy of being prospected.

Considering the Mother Lode as an ore channel, 6,000 or more ft. deep and 120 miles long, then the explorations of the past have probed into a mere fraction of the total ground in the channel. In view of the great amount of exploration that is yet possible, and considering that experience has demonstrated that poor surface values do not condemn deeper zones, it doesn't seem reasonable to assert that the best and the biggest prizes of the Mother Lode are gone.

The ore deposits often were tricky, so that early in the business, the old-timers learned to follow the ore rather than to take short cuts to its supposed position at deeper levels. In the 1890's, the Dutch mine in Tuolumne County was making quite a record for gold production under its manager, A. Trittenbach, a close friend of mine. Trittenbach told me repeatedly at the time that he "couldn't trust his ore to keep its place", so he had adopted a practice of following the ore down with a winze to the next level, in order to be sure of its exact location there before the shaft was deepened.

Faults and Pinches

In one of the most noted mines on the Lode, the vein—a large one—had been followed down at a regular pitch to about 1,500 ft. below the croppings, where it seemingly "bottomed". An exploration below the 1500, picked up the continuation of the vein 180 ft. out in the "hanging", going down at its original pitch.

In another prominent mine, I saw faces in drifts and stopes where the ore had pinched completely out of the vein, bringing the walls together except for a gouge between, "the thickness of a knife blade" as the miners' expression goes. This mine had previously been closed down, because the man in charge believed that he had reached the end of the orebody. The new management drove ahead on the pinches and in some places had advanced less than 20 ft., when the vein opened out to a 12 to 15-ft. width of good ore.

Men who will mine on the main ore channel of the Lode, need have no fear that the ore shoots will not go down. However, they must be prepared with proper finances, to go through the lean zones when they are encountered, and otherwise to explore for continuation of payable ore that has temporarily been lost.

Almost without exception, the important Mother Lode gold pro-

THE BLACK OAK MINE, Garden Valley, Calif., aroused much interest in the middle thirties, but failed for lack of sufficient ore.

ducing properties were discovered in the period between 1849 and 1870—and by prospectors who came upon payable ore in surface croppings. These finds were made at comparatively small expense, because the ground level of their ore shoots was a zone that carried good values. In view of the fact that the ore deposits in this great channel occur, as I have pointed out, with zones of varying values, it is reasonable to believe that discoveries of hitherto unknown ore shoots, not so easily accessible, will be made in the future, when the price for gold will warrant proper exploration—to be carried on with ample capital and good mine management.

Little System Used

After the early-day prospectors had passed on, the Mother Lode surface was subjected to very little careful search. The only later-day attempt that I know of, made seriously to locate new ore shoots along the Lode, was one conducted by W. J. Loring about 1915. Loring made a systematic trenching and sampling of the surface of the Calaveras Consolidated vein for a distance of close to a half-mile, that "showed up" two shoots of ore in that distance. His disclosures enlisted the financial support of Boston capitalists in his Carson Hill Mines project, which included the Calaveras Consolidated ground, and which yielded a gross of over $8,000,000 in gold (at the old price), during the period of Loring's management.

There has been a mistaken belief that great amounts of money were expended and lost on the Mother Lode in attempts to find and make profitable mines there. It is true that a great many mining companies were promoted that, in the aggregate, lost a lot of money for the stockholders. Almost without exception, these promotion companies were under-financed to begin with. Invariably, surface plants, beyond their needs, were constructed to impress investors. The cost of these plants used up so much of the available funds that insufficient money was left to make necessary explorations for ore.

I cannot recall a single instance of a well-financed company being formed, for the purpose of prosecuting systematic and substantial explorations on new ground of the Mother Lode. In the middle 1890's, W. C. Ralston, now deceased, then manager of the Melones Mining Co. at Carson Hill, discussed with me the need for just such undertakings. Later on, he made plans for raising capital of one million dollars (a large sum in those days), with which he proposed "to do extensive prospecting in likely spots along the Mother Lode". Before he could execute this plan, however, a turn of Fate ended his Mother Lode career.

Ralston's Mistake

Ralston's operation on Carson Hill, of which I had a close-up view, is worthy of special mention in any review of the Mother Lode. In the early history of Carson Hill, its surface was one of the "rich diggings" of the 1850's. Quoting from an article by John A. Burgess—"In 1854, a lump of gold was mined (on Carson Hill) that weighed 2,340 troy ounces (160 lbs. avoirdupois), valued at $43,534." . . . "There is no accurate record of the early production from Carson Hill, but the total production is estimated to be over $26,000,000."

Previously to Ralston's operation on Carson Hill, his father-in-law, G. W. Grayson, early-day Oakland and San Francisco capitalist, then well known as the owner of the rich Virtue mine in Oregon, had operated a 40-stamp mill on the north slope of Carson Hill, with ore from the hill-top surface of his Reserve claim, one of the Melones group. This milling operation went on for a number of years, with a well known mining man, Buckminister, as manager for Grayson—and was closed down in the late 1880's. About 1891, Ralston acquired this mine property from Grayson. Then, largely through his own efforts, Ralston sold a bond issue in New York and Boston from which he realized $900,000, to be used to carry out his plans for his newly organized Melones Mining Company.

Mass Mining Infeasible

A 4,400-ft.-long tunnel was driven in from the Stanislaus River side, to tap the Grayson ore 1,000 ft. below the croppings, which tunnel was used for ore haulage and general mine service during all of the subsequent operations on Carson Hill. A 100-stamp mill was installed on the hillside just below the tunnel entrance, which was operated by turbine water wheels, supplied through pipe lines from the nearby Stanislaus River.

In order to "mass produce" his ore at lowest cost, Ralston adopted the "glory hole" method of mining, which has failed in about every trial on the Mother Lode, notably some years later at the Royal Consolidated mine and the Alto mine.

As the "glory hole" deepened, the proportion of waste material caved in from the walls increased until the milling product yielded so little per ton above costs that, interest payments on the bonds could not be met. At this juncture, the bondholders took over—Ralston had lost out because of his experiment with the "glory hole" method of mining, which Nature had made well-nigh impracticable for Mother Lode orebodies.

Ralston lost out on Carson Hill by a narrow margin. As it was, he initiated deep mining on this fa-

mous hill and opened up its main vein to a depth of 1,000 ft. below the croppings. Ralston's workings had been deepened by his successors to about the 4,500-ft. level. when the property finally closed down. And here, to bear out my statement that abandoned mines on the Mother Lode are not to be considered worked-out properties, I quote from an article written recently by John A. Burgess, who was mine manager for the last operating company on Carson Hill. "The late Olaf Wenstrom, the last manager of the (preceding) company, told the writer in a letter that there is still ore at the bottom, of good milling grade, some of it showing visible gold. No mining has been done since, at that level (the 4,500-ft. level)".

Most of the properties were privately owned and no records were passed out to the public. Then, too, those were times before the roving reporters came, who today are all over the world, delving into and writing about every subject that has any interest.

Lost Mines

I am one of a very few now living, who were familiar with the Mother Lode through the years of its active life. For most of this period, I was one of the owners of the Angels Iron Works, and so had exceptional opportunity to keep in touch with mining affairs within 40 miles or so either way from our shops. My business often took me underground in the mines, so that I gained some knowledge of ore conditions that were not generally known. In addition, I indulged occasionally in minor mining ventures on my own account, and at times I grubstaked the prospectors. Among by various experiences, were searches, during the 1890's, for three separate "lost mines"—all of which were genuinely lost and never have been found. My father and myself knew the individuals who were the discoverers, and we had seen the "rock" at their homes—such specimens as would get any miner "going". After the sudden deaths of these men who took their secrets with them, I spent some time in each case, in searching through a section of this gold country—believe it or not—where underbrush extended for miles, impenetrable to such extent that most of my traveling was done on hands and knees.

As a prize-laden field for exploration, I would call attention here to a series of veins, carrying complex ores with copper values predominating, that intermingle with and run parallel with the gold-ore veins of the Mother Lode West Belt, throughout its entire length. Besides the copper content, these ores carry values in gold, silver, zinc and lead, and heretofore have been classed as smelting ores. The most extensive and the most profitable developments of these complex ores have been made in Calaveras County.

Copper Bonanzas

The old Union Copper mine at Copperopolis, now known as the Calaveras Copper mine, produced from its discovery shaft in the early 1860's, some spectacular ore that "paid dividends from the grass roots", and enabled the original owners, quite early in its development, to sell the mine for over one million dollars—a princely sum in those times. Other mines in the Copperopolis area with similar ore—such as the Napoleon that produced $4,000,000 from a depth of 300 ft.—joined the Union mine in staging a real early-day boom when large shipments of complex ores were leaving the mines on ox trains, to be transported overseas to smelters in Swansea, England.

The Penn mine at Campo Seco, Calaveras County—originally the Borger Copper mine—over a long period beginning in the late 1890's I believe, had a production record equal in value to that of some of the best Mother Lode gold properties, and its workings went down to a depth of 3,000 ft. I remember that John Raggio, president of the Commercial and Savings Bank of Stockton, who handled the accounts of this mine for Harmon, the Chicago owner, made this remark to me—at a time when the mine was paying dividends of from $30,000 to $50,000 per month —"Do you know that the Mother Lode has a copper mine as good as any of its gold mines?"

While the old Lick House in San Francisco was still the rendezvous of mining men, before the fire of 1906, I had a talk there with an old friend, Christian Borger of Campo Seco, who had just returned from a visit to the Greene Cananea copper mine in Mexico. He was full of the story of Greene's project, and told me that $8,000,000 had been spent there in preparation "before a pound of copper ore was treated". Borger said to me "I can't understand why our capitalists would go to a foreign country to mine 2% or 3% copper ore, when right here at home (in Calaveras County) they can find equally large deposits of copper ore of a better grade". As Borger was the original owner and operator of the Penn mine and was one of our "copper men" of that period, I had respect for his statement regarding the copper resources of our section of the gold country. In confirmation of Borger's opinion, I was told some years later by a Mr. Lake, who then was the smelter superintendent of the Calaveras Copper, that he had gone over every foot of the ground on the copper belt between the Mokelumne and the Stanislaus rivers, and that he was convinced that it was destined to support large future copper mining operations. Some day, explorations may prove that these old-time mining men knew their business.

Favorable Location

No other gold field in the world is located as favorably as the Mother Lode. It has well been referred to as "God's country". Its climate is most agreeable. Its mine operations can be carried on the year round, in comfort and without interruptions. It is in the midst of a highly civilized community. The finest summer and winter playgrounds in the nation are within a few hours drive of its mines. It is close to a large and growing labor market, and to important commercial and industrial centers. The finest timber forests on earth are within a few miles of its mines. Power transmission lines cross its territory and furnish power at reasonable rates. These same mountains supply abundant water for every purpose. Great oil fields and refineries are in neighboring sections of the State. Its highways are part of the most up-to-date highway system in the land. In short, the Mother Lode is ideally located for a large mining industry.

The Mother Lode yielded great wealth of gold at a critical time in our history, when it was a factor in restoring the unity of this nation and in paving the way for its present prosperity and greatness. Its treasures of precious metal have not been depleted. They are destined, in my opinion, to make future valuable contributions to world prosperity.

Norway Equips Iron Mine

Large-scale open-cut operation of Sydvaranger, in Arctic, expected to give low costs with full production in 1952. Ore beneficiation studies include work on pelletizing.

TEN MILES FROM THE RUSSIAN BORDER, in the twin towns of Kirkenes and Björnevatn, 400 miles north of the Arctic Circle, the United States and Norway are betting on an iron mine—the Sydvaranger.

It looks like a good bet: The iron is there—50 years' supply, easily accessible and remarkably free of sulphur and phosphorus. The equipment, almost entirely American-supplied through the Marshall Plan, will make Sydvaranger the most modern mine in Europe, and consequently one of the cheapest to operate.

The "know-how" is there, too —top personnel are all graduates of the Technical University of Trondheim. The ten key men have each had a good look at U. S. mining methods and brought back to Norway a new plan for working the mine.

Finally, the determination is there—the mine was completely ruined by the Germans in the last days of the war; both Kirkenes and Björnevatn were destroyed, yet today both towns have virtually regained their prewar population and the mine itself is expected to be in full production in 1952 when Marshall Plan aid ends.

Balanced against these advantages, the fact which makes a gamble of a predictably profitable iron mine, there is geography. The Russian border is ten miles away.

American Influence

Throughout the mine, American influence on methods will be apparent: in the continued use of open-cut operation (original plans had been to go underground), the use and maintenance of churn drills, electric shovels of a size not used in Europe, truck and conveyor belt transportation. All these new methods and many others which will be introduced are designed to increase productivity and restore the mine to its position as a source of high-grade ore. The ore itself, when concentrated, will probably be shipped as pellets about the size of marbles.

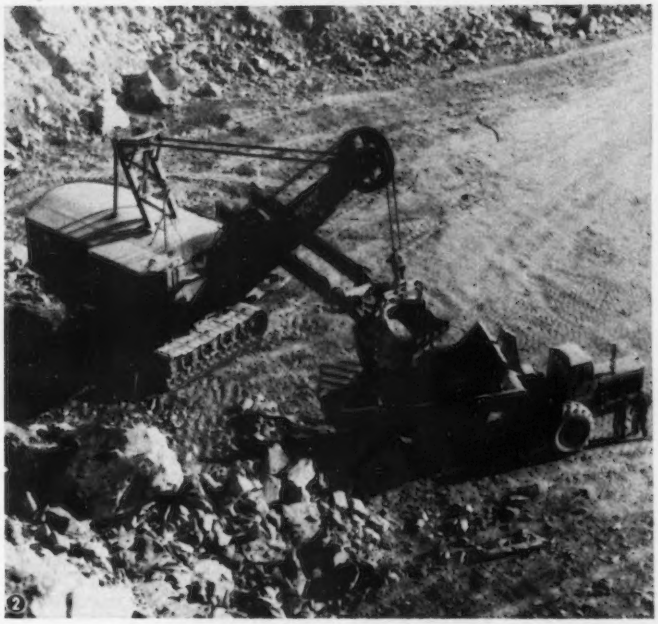
1. SYDVARANGER'S MAIN CUT is about a mile long, 1000 ft. wide, and runs north and south. The ore is magnetic, very hard, averages about 30% iron, occurring in the proportion of 2 tons of iron-bearing rock to 1 ton of waste. Reserves are estimated at 100 million metric tons "in sight," and one billion for the entire field.

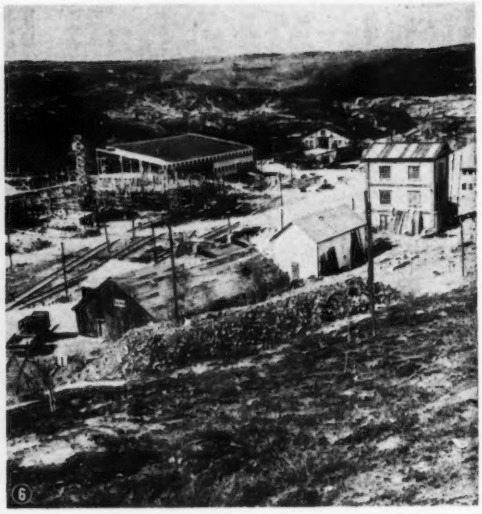
Summing up, the following are agreed to be the principal things which the Sydvaranger mining men have learned from what they saw in the United States: the value and method of preventive maintenance and constant inspection of equipment; the value of rationalized use of modern equipment to save time and manpower. Specifically, it was due to the visits of the mine management to the United States that the decision to operate an open-cut rather than an underground mine was reached. This decision was based in large part on the observation that American transportation equipment gave a mine greater flexibility, inasmuch as trucks can climb steeper grades and take shorter-radius curves than the mine railway which was formerly in existence. By the use of churn drills, larger amounts of ore will be dislodged by one blast. In all, considerable time and manpower will be saved. Ultimately, perhaps 25 years hence, operations underground will have to be resumed, but the management feels that by that time so much new equipment will have come along that the change will not be particularly noticeable in day-to-day operations.

The mine should employ 750 men when it reaches full production next year (See photos 1-4). The operation, it is expected, will mean the moving of 2.3 million tons of iron-bearing rock, 1.2 million tons of waste, and the shipping of 1 million tons of concentrate. Before the war,

With Marshall Plan Aid

2, 3, 4. MINE EQUIPMENT, bought in part through Marshall Plan, includes five Bucyrus-Erie electric shovels (one 3-yd., four 4-yd.), twelve Tournarockers, two Tournadozers, four D-8 Caterpillar tractors, two Fords, and 10 Bucyrus-Erie 42-T churn drills. PHOTO 2, Loading ore. PHOTO 3, Loading holes for blasting. PHOTO 4, Drilling with a jackhammer machine for secondary blasting, or "blockholing."





5. ORE PREPARATION in Sydvaranger's new plant at Kirkenes, here seen under construction, includes crushing, grinding, concentration by magnetic separation and pelletizing. Equipment includes one primary 54-in. gyratory (capacity 1,000 tph.), which will probably handle 600-800 tph.; four ball mills 10 ft. 8 in. in diameter by 17 ft. long; six 7-ft. Symons cone crushers; and four 1,200-hp., 180-rpm. synchronous electric motors. Twisted railings and blocks of concrete in foreground are results of wartime bombing.

6. ADMINISTRATION BUILDINGS at mine. In background, under construction, is the new machine shop.

Sydvaranger Staff Members Have Visited United States Mining Areas

Johan Kraft-Johanssen, technical director, worked in the United States in 1928 and 1929 with General Engineering, of Salt Lake City. He is also president of the Mining Engineers' Section of the Norwegian Engineers Association.

Karl Seines, chief mechanical engineer, visited the United States after the war, studying particularly maintenance work at different mines.

Marcus Digre, superintendent of concentrating and agglomerating processes, spent most of 1948 and two months in 1950, partly at the University of Minnesota, partly on the Mesabi.

Asbjörn Börsting, chief electrical engineer, visited the States and Canada in 1950 and studied preventive repair and inspection at the Mesabi mines and at International Nickel mines in Canada.

Arne Hofseth, chief mine superintendent, studied in the United States in 1937-38 at the Colorado School of Mines. In 1949 he returned to the United States through Marshall Plan Technical Assistance to study hard-rock mining.

Odd Evenson, chief mine foreman, also came to the United States in 1950 for four months and observed operations at International Nickel, in Canada, and on the Mesabi and in New Mexico.

Fridtjof Langseth, transportation maintenance superintendent, visited the Mesabi range, and mine transportation manufacturing plants for four months in 1950. His father is a mine shift-foreman.

Anders Sandaker, the company's consulting engineer, has worked in the United States for several engineering firms and has been in charge of the designing of the new plant.

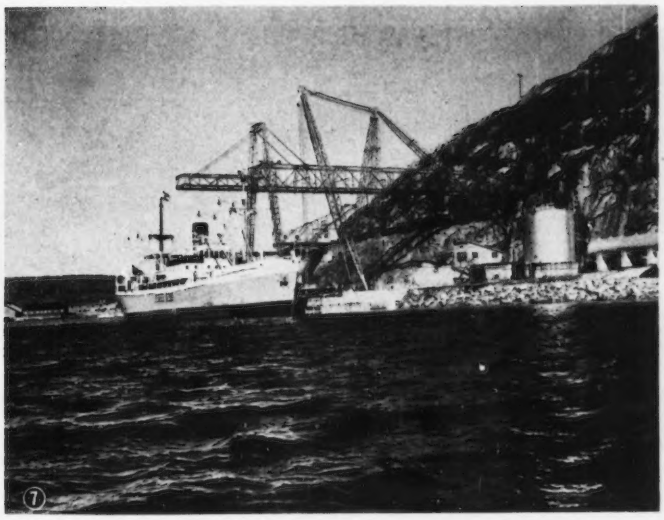
Hans Torgersrud, works manager, visited the United States before the war, chiefly to observe mining operations in New York and Pennsylvania.

1,200 men were required to produce 870,000 tons of concentrate per year. The difference will be made up by the use of the modern American equipment.

Primary Crushing at Mine

The primary crusher (see caption of Photo 5) will be placed in a pit which has been prepared 32 meters above sea level. The present lowest level of the mine is at 68 meters above sea level. Ore from the crusher will travel by a Goodrich conveyor belt through a tunnel 250 meters long to the mine railway, along which it will be transported 9 km. from Björnvatn to the processing plant at Kirkenes. At the latter will be provided two further crushing stages, two grinding stages, the ore-concentration, pelletizing, storage and, finally, the shipping facilities.

Sydvaranger has been experimenting with pelletizing for the last four years along much the same lines as are being followed in the United States. Close contact has been maintained with one of the American companies, which is operating a pilot plant. Several members of the Norwegian company's staff have visited the United States, and two of them in particular have spent considerable time in visiting the pilot plants already built. The



7. QUAY AT KIRKENES. Crane and gantry in background have served to unload equipment shipped under Marshall Plan to Sydvaranger enterprise. An export quay has also been built.

company expects to ship a concentrate running 66% in iron as standard. If plans to make pellets succeed, one ton of the pellets will require about 2 1/3 tons of ore.

A tunnel 1,350 ft. long has been driven to carry the conveyor belt from the processing plant to the export quay. Although there is ample water power near Kirkenes, it is unavailable for use by the mine because the rivers are partially under Russian control. Consequently, the mine has had to build its own steam power plant. It is estimated that the mine and processing plant will use about 60 million kw. hr. per year.

The new export quay to the left of the quay seen in photo 7 will be 100 meters long and, it is reported, will accommodate ore boats up to 15,000 tons.

Ore Long Known

The Sydvaranger mine was opened in 1907, although the existence of iron deposits in the region had been known since 1866. At that time Kirkenes was a tiny trading post—three houses, a store and a church—lying on the only sizable patch of near-level ground on the shores of the great South Varanger Fjord, which, with the Long Fjord, leads northward from the Finnish Lakes and the Norwegian mountains through East Finnmark to the point where the main Varanger Fjord joins the White Sea.

By the time of the German invasion in 1940, the two towns had a combined population of about 5,000, schools, a customs house, telephone and telegraph offices, power plants, saw mills, a bank, a police station and all the other facilities needed by a modern community, plus the mine itself at Björnevatn, and the mine's concentrating and sintering plant and export docks at Kirkenes. Five years later, when the Germans left in 1944, the work of 35 years had been almost completely destroyed (Arctic Kirkenes shares with the Mediterranean Malta the unhappy distinction of having been most often bombed during the war, but the real damage was done by the demolitions of the retreating vengeful Wehrmacht).

Now, five years after the war, the towns have been rebuilt and approximately 4,000 people live in them. The bank, the police station, the power house and all the rest are once more in operation. Only the mine and the processing plant remain to be restored to operation, and these are being put in shape as fast as Norwegian energy and U. S. money can do the job.

Mine 60% Government-Owned

The original company founded to exploit the Sydvaranger ore got rights from the Norwegian Government to mine a strip approximately four miles wide and ten miles long for a hundred years. Later, additional land rights were obtained so that now, beside mine and plant property itself, the company owns approximately 70% of the land in Kirkenes and 100% of that in Björnevatn. In theory that might make the villages "company towns," but so far, at any rate, none of the undesirable features of such communities are visible.

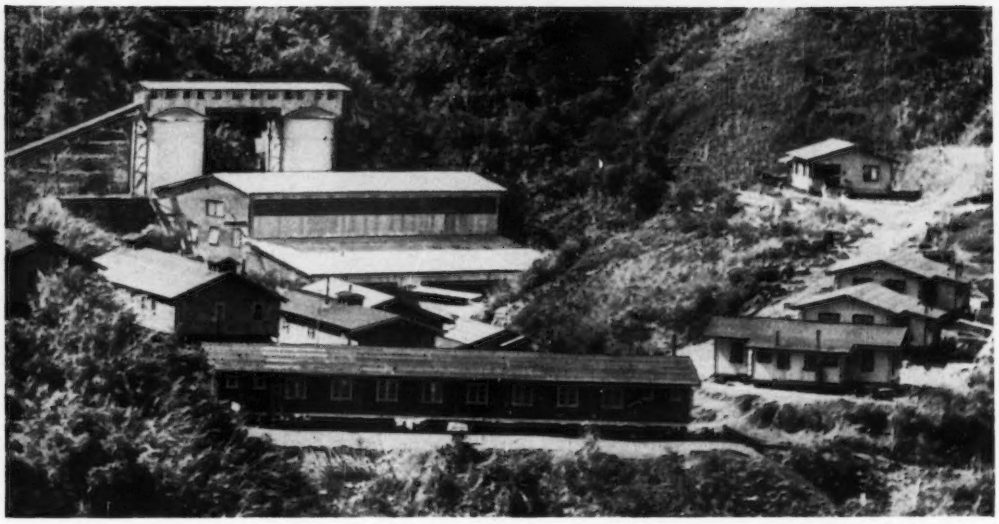
Actually, the mine itself is now 60% government-owned and 40% owned by Norwegian private capital —the Norwegian Government took over the 40% ownership which had been German and assumed title to 20% more as the mine's participation in post-war rehabilitation financing of various sorts. So far, this typically Norwegian compromise between private and government ownership has worked out well, though later on, when the mine gets to producing, there is a possibility that some pressure may be brought to bear to sustain a newly-created Norwegian steel industry with Sydvaranger ore which might be profitably exported. Meanwhile the management is looking forward to earning some 50 million Norwegian kroner (about $7½ million a year) from exports when the mine is in full production.

Full production for Sydvaranger means year-round operation. Despite its location in the high latitudes, East Finnmark does not get too cold for outdoor work at any time—nothing like the winters of Minnesota's Mesabi range or the International Nickel mines in Canada.

Like Boom Town

Kirkenes and Björnevatn have a boom-town atmosphere of urgency and success about them. Building is racing along; everyone is busy. And the local communists are losing strength as more and more people know "the government hasn't forgotten us and the United States is helping us."

Meanwhile, of course, Russia is just ten miles away and it would be untrue to say that from time to time the mine people don't look eastward over their shoulders. In the summer when there's hiking and fishing and football at midnight, the threat doesn't seem great. In the winter when the sun doesn't rise for six weeks, people are likely to sit around and worry a little. Still, "The main thing," they say, "is to get the mine going. We may be close to the North Pole, but we're close to the Western World, too." The iron mine looks like a good bet.



LEPANTO'S MILL, rebuilt since the war, handles 1,000 tons of ore per day. Major copper-bearing mineral is enargite.

Rebuilding Lepanto—The Far East's Largest Producer of Copper

After suffering wartime destruction of its concentrator and other surface units, this Philippine enterprise has been rehabilitated and is now milling 1,000 tons per day of 4-5% copper ore in a modern plant.

GEORGE MURRAY
Mine Superintendent

HUGH H. BEIN
Mill Superintendent

Lepanto Consolidated Mining Co.
Mankayan, Mountain Province, P. I.

THE MINING BOOM in the Philippines during the Nineteen Thirties saw the birth of Lepanto Consolidated Mining Co.—today the largest producer of copper in the Far East. The precise date was Sept. 21, 1936. A modern flotation plant of 400 tons capacity was built to treat the copper-gold-sulphide ore. Operations continued in a profitable manner until the Japanese invaded the Islands in 1941. Mill and other surface buildings were then destroyed by the mine staff on orders from the U. S. Army.

Knowing the great value of the property, the Japanese were much disturbed by their failure to seize it undamaged. As most of the Lepanto equipment had been so badly damaged as to be unusable, the Japanese plundered many other Philippine mines to equip the property, in their frantic effort to produce much needed copper. In 1942, they shipped about 10,000 tons of 8% ore and by early 1943 had their new mill in operation.

In spite of many difficulties, including use of coconut oil for diesel fuel and xanthate of doubtful origin, this plant treated almost a half million tons of 3.2% copper ore in its year and a half of operation. Not more than half of the concentrate produced ever reached Japan. The rest was lost to guerrilla action on mountain roads or sunk in ships bombed in San Fernando Bay or torpedoed in the China Sea.

American bombing of Lepanto began in 1944 and continued intermittently until July, 1945, when heavy saturation raids reduced the surface plant to rubble and twisted steel. Intense ground action by Philippine guerrilla forces supported by American artillery drove the Japanese Army units out of the broken concrete, through the mine workings, which had served as their barracks and across the mountains to the final climax, the surrender of General Yamashita.

Postwar Rehabilitation

As part of the recent history must be mentioned the tremendous rehabilitation program facing the directors and staff when it was decided to resume operations after the war. This extensive project was carried out under the direct planning and supervision of the general superintendent, C. B. Foster.

Surface plant and installations had been leveled by the American Air Forces. Areas had to be cleared of wreckage before construction work started although, in some cases, columns and roofs were

Lepanto's Location

LEPANTO lies well within the Mountain Province in northern Luzon, in the Philippines. Situated in the sub-province of Benguet, about 60 miles north of Baguio and 250 miles north of Manila, the mine is reached by the famous Mountain Trail. This trail is a masterpiece of road construction and serves as the life line for most of the province.

Elevations at the property range from 3,200 to 4,500 ft. The climate is moderate, with temperatures running from 60° F. to 80° F. The rainy season lasts from May to October, with an annual rainfall of 170 in.

Lepanto's Early History

Copper had been extracted from the mine long before the written history of the district started. The native Igorots and later the Chinese, before the Spanish occupation of the Islands, mined copper by the crudest methods. The first examinations of the deposit by an engineer was made by Don Antonio Hernandez in 1850, who found the natives removing overburden by "booming" with water released from the hillside above, and mining by "fire setting," consisting of heating the rock by building fires against the face and then throwing water against it.

In 1864, mining of the deposit was started by Contabro-Filipino Co. under the direction of Don Jose Mario Santos, who operated the property until his death in 1874. A year later the Spanish operations ceased.

After the American occupation of the Islands in 1900, prospecting was resumed by Americans but little was done until Victor E. Lednicky did extensive exploration work about 1922, and secured patents for the more important claims.

Table 1. Lepanto Stoping Costs. August, 1950

(Distribution from tons broken)

	All Stopes	Shrinkage	Square set	Sub-Level	Cut-and-Fill
Tons broken	33,168	14,199	4,587	7,125	7,257
Manshifts	3,954	856	824	667	1,607
Labor costs per ton	$0.32	$0.19	$0.54	$0.28	$0.44
Explosive	0.24	0.16	0.35	0.24	0.32
Timber	0.05	0.03	0 08	0.05	0.10
Other supplies	0.05	0.03	0.08	0.05	0.06
Total direct	$0.66	$0.41	$1.05	$0.62	$0.92
Indirect	1.34	0.79	2.41	0.95	1.88
Total costs	$2.00	$1.20	$3.46	$1.57	$2.80
Tons per manshift	8.39	16.59	4.52	10.68	5.60

Table II. Mining Indirect Costs. August, 1950

(Distribution from tons milled)

Tons milled	31,010
Supervision	$0.19
Gathering	0.17
Main haulage	0.14
Equipment, maintenance and repairs	0.13
Air drill repair	0.11
Steel sharpening	0.04
Mine maintenance and repairs	0.10
Assaying	0.04
Compressed air	0.27
Ventilation	0.02
Lighting	0.19
Engineering	0.02
Piping	0.04
Lamp house operation	0.04
Timber framing	0.02
Supply haulage	0.01
Tool nipping	0.02
Mine safety	0.03
Mine office	0.01
Miscellaneous	0.05
Total	$1.64

Table III. Stoping Summary. August, 1950

(Calculated from tons broken)

Level	1000-meters	1030-meters	1070-meters
Tons	7,643	18,013	7,512
Feet of hole drilled	11,832	23,351	12,038
Tons/ft. hole	0.64	0.77	0.62
Manshifts	735	1,078	1,051
Tons per manshift	10.4	16.7	7.1

Table IV. Production Summary. August, 1950 (a)

(Calculations on tons drawn)

Place	Tons	Holes	Feet Drilled	Average Depth	Men Present	Men Absent	Meters Advance	Tons per Manshift
1000-meter level	10,301	3,676	14,239	3.9	1,898	292	109.4	5.4
1030-meter level	10,457	6,643	28,552	4.3	1,571	260	122.41	5.3
1070-meter level	10,252	4,623	21,747	4.7	2,715	196	141.3	3.8
Mine	31,010	14,942	64,538	4.3	6,584	748	373.11	4.7

(a) These figures exclude shaft and shop crew.

Table V. Lepanto Ore Reserves as of July 31, 1950

	Tons	% Cu.	Oz. Gold Per Ton
Positive ore	1,333,310	4.40	0.139
Probable ore	778,990	3.85	0.147
	2,112,300	4.20	0.142
Broken ore in stopes	57,620	4.50	0.153
Ore pass ltock	2,840	4.47	0.137
Total ore reserve	2,172,760	4.21	0.142

WARTIME DESTRUCTION suffered by Lepanto's original plant may be visualized from ruin of machine shop, in foreground, as it was in 1945. In background is the mine outcrop.

erected over the debris to allow clearing and building in the rainy season.

As mentioned hereafter, the stoping procedure employed by the Japanese called for large, oversize sills which weakened the orebody excessively. This condition has increased the present mining problem and costs.

A credit arrangement with the Hongkong and Shanghai Banking System proved successful and, on June 29, 1948, the new 500-ton mill was placed in operation. This venture's success encouraged the directors to the extent that a second building program has been since completed, whereby 1,000 tons per day is being milled.

Lepanto Geology

The principal rock divisions of the Lepanto district are all igneous in derivation and no definite age correlations have been made. The regional work which has been done in the Mountain Province and the correlations made with rocks of known age, however, indicate that all formations are Tertiary or younger.

Andesite is the oldest rock in the immediate Lepanto area. This is characteristically a fine-grained, gray-green rock. Practically all specimens contain secondary pyrite. In many places, the andesite is bleached a light grey-green by the solutions accompanying the formation of pyrite. In other places it is black-green, due to a concentration of the ferromagnesian minerals.

Intrusive into the andesites in the southeastern portion of the Lepanto area is the quartz-diorite porphyry. The rock varies considerably; however, the average shows phenocrysts of quartz and plagioclase feldspars.

The latest rock unit in the area is locally termed capping, which is a heterogeneous mass composed chiefly of clastics with interbedded flows lying unconformably over the area. It covers or "caps" the Lepanto orebody, varying from an almost entirely siliceous mass to almost pure kaolin, which obliterates the original nature of the rock. This capping was relatively impermeable and a very important factor in retaining the mineralizing solutions, which deposited the Lepanto ore.

Lepanto's orebody is a mesothermal deposit, extremely unusual in shape, the thickness of which is approximately 200 ft., but with length and width as yet unknown. However, the deposit has a proven horizontal length of 1,500 meters following below the capping.

The original horizontal width is unknown, as the orebody was split longitudinally by a fault which considerably displaced the broken segments. This fault is the major structural feature of the district, which roughly parallels the granite-andesite contact. Although the strike and dip vary locally, the average apparent strike is S.50° E., while the average dip is 70° N.E.

A silicified shear zone parallels the Lepanto fault. It is in the shear zone that the orebody occurs.

The ore occurs as fissure filling and silica replacement. Movement adjacent to the fault followed the deposition of early flinty quartz. The silicified andesite was fractured and brecciated, preparing the channel for the second mineralization which brought quartz accompanied by gold. The third mineralization was the most important as it carried enargite, which was deposited as replacement, and fracture filling in the siliceous mass of earlier quartz. Chalcopyrite was introduced, following enargite and then barren quartz. Into both the pre-fault footwall and hangingwall of the main orebody, branch veins are found extending up to 100 meters. Development of these veins, just begun, already indicates that they will become important producers.

The orebody at Lepanto is noteworthy geologically in three respects:

1. The values occur almost entirely in the form of enargite with small amounts of chalcopyrite, tetrahedrite and bornite.

2. The orebody has relatively small vertical thickness but a long strike length.

3. The Lepanto orebody strikingly shows the effect an overlying impermeable rock unit can exert to confine an orebody and cause it to be concentrated, rather than dissipated over a greater range.

Practical Geology Guides Development

Three main levels, namely, the 1000- and 1070-meter levels (elevations above sea level) have been developed and opened for stoping. Two development levels, the 1100 and 1150, are currently being advanced. The 1000-meter level is the haulage level running to the coarse ore bin. Two passes from each of the mining levels above supply the haulage level with the ore from these respective levels, thus minimizing gathering haulage and af-

fording maximum grade control. Total capacity of these orepasses is 3,000 tons.

The major guiding influences on development decisions are hinged on practical mine geology:

1. Drifting on the main fault, which is definitely post-mineral.
2. Raising to tap the capping which because it is unconformable, must be located at regular intervals.
3. Development of the branch veins by drifting outward from the main orebody. Infiltration of the ascending solutions have travelled along tension fractures into the footwall and hanging wall. These fractures form loci of replacement and filling, and have in many cases formed mineable orebodies up to 5 meters in width.

During the Japanese occupation extensive stoping was done, leaving long open sills parallel to the main fault, with no respect, however, for the future of the mine. These open sills and the great width of the orebody have created the major problem in striving to extract the ore with maximum recovery and minimum dilution.

Three Stoping Methods

Four major characteristics of the orebody determine the choice of stoping methods:

1. Proximity of the concentration of enargite carrying gold, to the fault and capping.
2. Changeable characteristics of the capping.
3. Great width of the orebody.
4. Wide range in grade of ore.
5. Strength and condition of the hanging wall.

Sub-level, transverse cut-and-fill, and shrinkage stoping methods are applicable and are conducted in the conventional manner. All stope blasting is done at the end of the day shift after close checking and approval of the foremen, who personally measure the depth of each hole, noting the burden and determining the powder content. The foreman permits the blasting of every hole, except those in the last three rows drilled. By this method the miners are drilling a short distance from the shattered zone, and the night shift starts to drill immediately.

Sub-Level Stoping. This method has been used where conditions permitted. One large block is under preparation for mining by this method. A haulage drift having been driven perpendicular to the fault in the footwall side, chute pockets are cut at 6-meter intervals, and a shrinkage slot 10 meters wide is mined to the capping. When the broken ore is drawn, the slot serves as the open stope from which receding stoping is conducted.

Two lateral sub-drifts are driven on the boundaries of the block on the lowest horizon of the ore. Identical sub-drifts every 8 meters above these lower sub-drifts are driven also before stoping is started. From these sub-drifts, the ore is benched into the open stope and slushed to the draw pockets. This gives a big tonnage per man-shift, miners working on each bench. A minimum of broken ore is held back until stope completion.

Shrinkage Stoping. Transverse shrinkage stopes in one block of the 1030-meter level were adopted because of the local occurrence of low-grade material next to the hanging wall, so that stopes 10 meters wide were opened up, leaving 2 meters or more submarginal rock (according to the grade) on the hangingwall and 6 meter pillars between stopes. So far, the capping has been very siliceous in this section so that, as the stopes are drawn, the pillars are stoped downwards with no bad results from the caving of the capping. Wherever the capping is firm, this method assures extraction with minimum dilution. Should the capping show weakness, the pillar will be left and extracted later by the cut-and-fill method.

Before stoping, a finger raise is driven on the footwall side to the level above for ventilation, and serves as the cut from which the back is drilled. All the holes are placed 4 ft. apart on approximately 80°, and are 5 ft. deep. Drilling is continuous until the cribbed manway on the hanging-wall side is reached. The manway is 4 ft. by 4 ft. This is the service manway and advances as the broken ore in the stope becomes higher.

Cut-and-Fill Stoping. In some blocks on the 1070 level, where the best ore is close to the fault, the cut-and-fill method of mining has been adopted. The transverse cut-and-fill stopes are 10 meters wide between 6-meter pillars. In each stope, a finger raise, prior to stoping, was driven to a drift parallel to the hanging wall on the 1100-meter level. The drilling cycle is conducted the same as in shrinkage mining, and three cuts are made before slushing the stope free of ore and filling. Four such stopes constitute the cycle so that at no time does the breakage suffer from lack of fill, or vice versa. The 1100-meter level drift, to which the finger raises connect, is a slusher drift. From it, pockets into the hanging were driven and a 100-ft. square block was caved.

The waste runs well and packs excellently. It is slushed to the desired finger raise, and fills the stope below, thus minimizing the cost of filling. No pillars have yet been extracted.

Stope preparation and development headings advance between 300 and 400 meters per month.

Following is the equipment which, due to early economic conditions, is not standardized as to brands: 25 stopers, 19 drifters, 10 jackhammers, 14 air tugger hoists, 5 air slushers, 6 electric slushers, 1 trolley locomotive (6-ton), 3 trolley locomotives (3-ton), 1 battery locomotive (3-ton), 2 Mancha's Little Trammer locomotives, 1 Mancha Mule, 33 Granby-type cars (4-ton), 37 Granby-type cars (2.5-ton), 31 rocker-bottom cars (1-ton), and 8 mucking machines.

Incentive System Used

Contracts and Wages. All stopes, development, and haulage workers are on a work bonus and competitive measures are highly encouraged. These methods have proven very successful.

The minimum underground wage scale is $1.20 per day plus a rice ration, housing fuel, lights, and hospitalization.

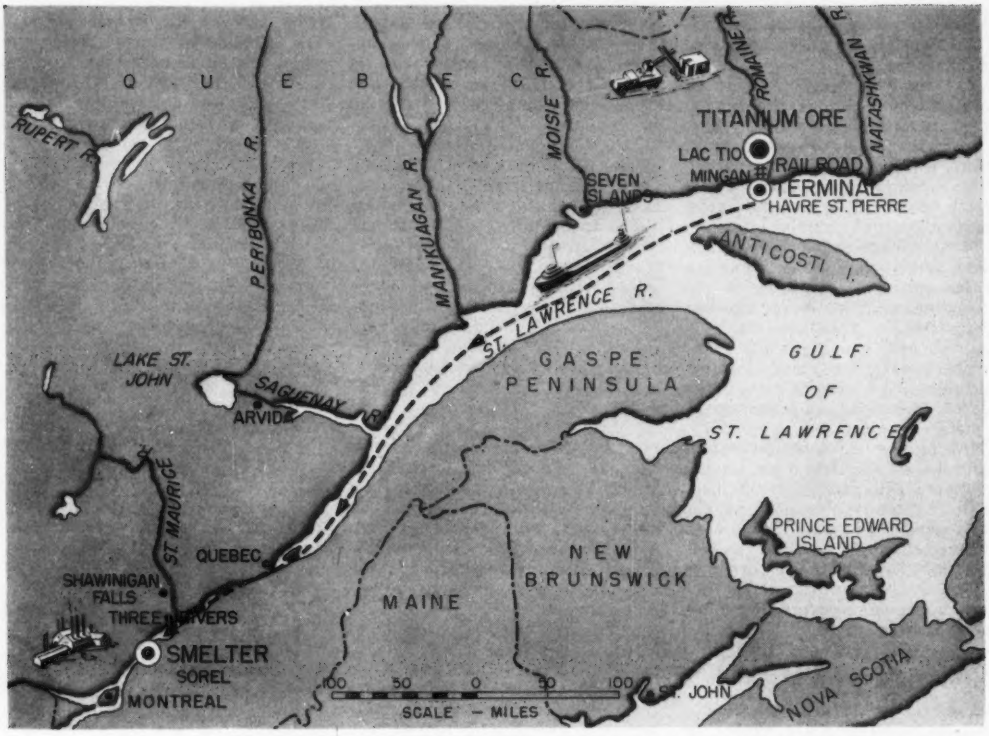
Work Bonus Rates. These rates are: $0.55 per cubic meter in shrinkage stopes, $1.20 per cubic meter in cut-and-fill stopes; $0.88 per cubic meter in sub-level stoping; $1.53 per cubic meter in square-set stopes. These rates are paid on ore broken. The factor of 3 tons per cubic meter is used to determine broken ore reserves, and the draw has proven this to be correct.

Rates for drifting, crosscutting and raising are as follows:

Drifting and Crosscutting — With mechanical loading, $1.37 per cu. meter. Without mechanical loading, $1.53 per cu. meter. Timbering: per set, $2.75. Raising, $1.15 per cubic meter. Chutes: Per each standard chute placed, $12.00.

Payment for development headings in cubic meters in preference to linear meters was the choice of the native mine bosses.

Lepanto's milling operations, shops, power plant and other aspects of the enterprise will be described in an early issue.



FOUR LINKS in the titanium production chain include the mine at Lac Tio, a 27-mi. railroad to the St. Lawrence River, loading facilities at Havre St. Pierre, and the newly opened Kennecott-New Jersey Zinc smelter at Sorel.

New Smelter Gives Titanium

A $30,000,000 INVESTMENT began to bear fruit in December as the first of five new type electric furnaces at Sorel, Quebec, began smelting titanium ore from the huge Lac Tio deposit. Capital and personnel for research, mine development, transportation by rail and sea via Havre St. Pierre, and smelting facilities, were supplied by Kennecott Copper Corp. and New Jersey Zinc Co. Quebec Iron & Titanium Corp. has been formed as the operating company. To convert ideas to blueprints and then to an actual railroad and smelter, required the know-how of the Fraser-Brace Companies, design engineers and constructors. Power, the third ingredient in the project, was the contribution of Shawinigan Water & Power Company, which had to build a 40-mi., 220,000-v. transmission line to supply the 120,000 kw. that will be needed.

Yearly output of the plant when it reaches full-scale production will be 200,000 tons of high-grade melting steel and 250,000 tons of a slag containing 70% titanium dioxide. (The Tahawus, New York, plant of National Lead Co., presently the world's largest producer, handles 250,000 tons of ilmenite a year, containing 45% TiO_2.)

Slag output of the plant will be shipped to titanium pigment producers in the United States. While there are at present, no plans for constructing a titanium metal plant at Sorel, ample low cost power which the process will probably require, is available. Such an expansion is definitely a possibility.

Melting steel will be sold to Canadian steel producers. While actually a by-product in this operation, this output will nevertheless be more than 6% of the figure for Canadian semi-finished steel in 1949. Moreover, since the Sorel plant could be converted to the production of high quality semi-finished steel, a rolling mill or foundry might easily be located at the site. During design, this possibility was kept in mind.

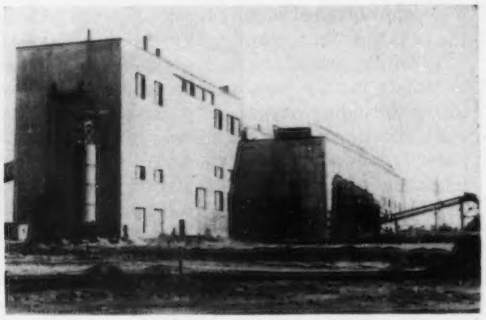
Feed for the furnaces will come from the 125,000,000 tons of ore already proved in the Allard Lake region of northeastern Quebec. About 50,000,000 tons of this is all but exposed above the railway grading at Lac Tio. Present mining is sufficient to insure delivery to dockside at Havre St. Pierre of 1,700 tons daily. Eventually, ore will be mined at the rate of 3,000 tons per day for the seven warm months of the year during which the mine will be operated and the St. Lawrence open for shipping. (Details of open-pit mining practice will be discussed in a subsequent issue of E&MJ.)

Ore is moved to the St. Lawrence River over 27 miles of railroad that is virtually all rock cut and

ILMENITE DEPOSITS at Lac Tio, to supply 3,000 tons daily, contain 50 million tons above the railroad grading.

27-MI. RAILROAD crosses swamp, 2 rivers at southern end and is almost entirely rock cut and fill to the north.

ILMENITE DEPOSITS at Lac Tio to supply 3,000 tons daily contain 50 million tons above the railroad grading.



SMELTER at Sorel will produce high-grade melting steel and a slag that runs about 70% titanium dioxide.

Industry a Lift

fill through some of the most varied and difficult terrain encountered in Canada. Maximum grade, however, has been confined to 2% for the northward haul of empties and 1½% for southbound ore cars.

At Havre St. Pierre a crushing plant that will eventually be a part of the permanent 250-ton per hour installation, has been erected at the loading dock. Ore is dumped into a 125-ton surge bin from which a chain feeder carries it to a 36 x 48-in. jaw crusher. After passing over a double deck screen, minus 2-in. material goes to a loading bin; the oversize is carried to a 4½-ft. cone crusher. This product is screened in a closed circuit and the shipping size passes to a small bin for reloading into ore cars. The cars stock the ore out from a 574-ft. trestle, accommodating a 20-car train.

Conveyor No. 1, 42-in. wide, located in a concrete tunnel under the stockpile carries the ore to Conveyor No. 3 which takes it to the loading tower.

Conveyor No. 1 extends 595 ft. and has a speed of 450 fpm. Ore is fed through a series of 37 gates bolted to the roof of the tunnel. These gates are hinged to provide automatic flow or shut off by the use of a small worm geared hoist and hand chain.

Conveyor No. 3 is 270 ft. long with a total rise of 49 ft. to the loading tower. It travels at a speed of 500 fpm. This conveyor extends through the boom section which is equipped with electrically operated, movable 40-ft. boom for loading right into a ship's hold. Capacity of the loading system is 2,700 tons per hour, but it is currently operating at 2,000 tons per hour.

To carry the crushed ore from Havre St. Pierre up the St. Lawrence to Sorel, 550 mi. away, 10,000-ton Liberty ships will be used. The round trip takes six days.

At Sorel the ore will be discharged from the ships by a tower unloader and carried to a stockpile by a belt conveyor. Subsequently the ore will be picked up by a reclaiming crane and belt-conveyed to dryers, then crushed, carefully weighed and mixed with coal, and then fed into the electric furnaces.

Heated to a temperature of 1,500° to 1,700° C., the iron in the ore melts and separates from the slag, which floats on the surface. When the furnace is tapped, the iron flows into a 25-ton ladle and the slag, still on the surface, overflows into a cast steel slag pot, as in open hearth practice. After the sulphur content of the iron is reduced in one of two conventional electric arc tilting furnaces, the resulting high grade melting steel is cast into ingots. The slag is cast into small blocks and crushed before shipment.

Each of the five stationary furnaces will be box-shape, with six electrodes in line. They are, therefore, a departure from normal electric furnace design, which consists

Wanted: A Method For Titanium

While researchers have made considerable progress in determining the properties and uses of titanium, they have yet to find a commercially acceptable method of producing the pure metal from its compounds. Just as many investigators had strived to isolate aluminum metal from its oxide before Charles Martin Hall solved the problem in 1886, so today many governmental, university, and industrial agencies are spending millions of dollars to find a solution to the similar problem of titanium. Many authorities predict that this solution is near.

Titanium metal is, of course, available, but in "sponge" form it costs $5.00 per lb. and in ductile form $7.50. For economical large scale production, however, a process which will produce the metal for $1.00 a lb. or less is required. Hall's discovery reduced the price of aluminum to this figure within a few years. Now semi-finished aluminum is under $0.20 a lb. Magnesium, the next most important light metal, is under $0.25.

Titanium, one of the most active of metals, has been difficult to isolate mainly because it combines readily with most elements, including oxygen, nitrogen and hydrogen. At least two methods of producing the metal are presently in use, and quite possibly several other methods, as yet unannounced, are receiving the attention of investigators. The Kroll process, developed by Dr. Wilhelm Kroll in Germany in 1932, has now been perfected by the U. S. Bureau of Mines, with which he is now associated. This method produces the sponge metal by reducing titanium tetrachloride with magnesium in the absence of air at elevated temperatures. By one of several techniques, including smelting and powder metallurgy, this sponge must be consolidated to obtain the ductile metal.

In Canada, Dominion Magnesium Limited is obtaining a powdered metal by a secret process, probably calcium reduction, straight from the commercial pigment grade titanium dioxide. This method allows Dominion to sell the powdered metal at $4.00 per lb., against $5.00 per lb. in the U. S.

While some researchers believe that these processes can be made economically feasible, others feel that an entirely new approach must be devised.

of a cylindrical shell containing three electrodes arranged in a triangle. Continuously fed and batch-tapped, the furnaces, operating the year round, will each treat 300 tons of ore per day.

These furnaces will be the first for large-scale smelting of a titaniferous ore with the intent of recovering the titanium. In the past the titanium and iron have either been separated by a combination of ore dressing and chemical processes, or in a normal smelting process where only the iron has been recovered, leaving the titanium to be discarded in the slag. Smelting of such ores has always required large amounts of flux to counteract the thickening of the slag caused by the presence of the lower valenced oxides of titanium and to permit good recovery of metallic iron. In that event, however, the dilution of the slag so lowers its titanium oxide content that recovery is not economical. Now a method has been found to control the conditions of the charge composition in the furnace so that little or no flux need be added. In addition to a marketable melting steel, the process now produces a slag which is suitable for acid digestion and leaching, which is the most prevalent method of treating titaniferous concentrates. From the leach solution hydrated titanium dioxide can be economically recovered by hydrolysis.

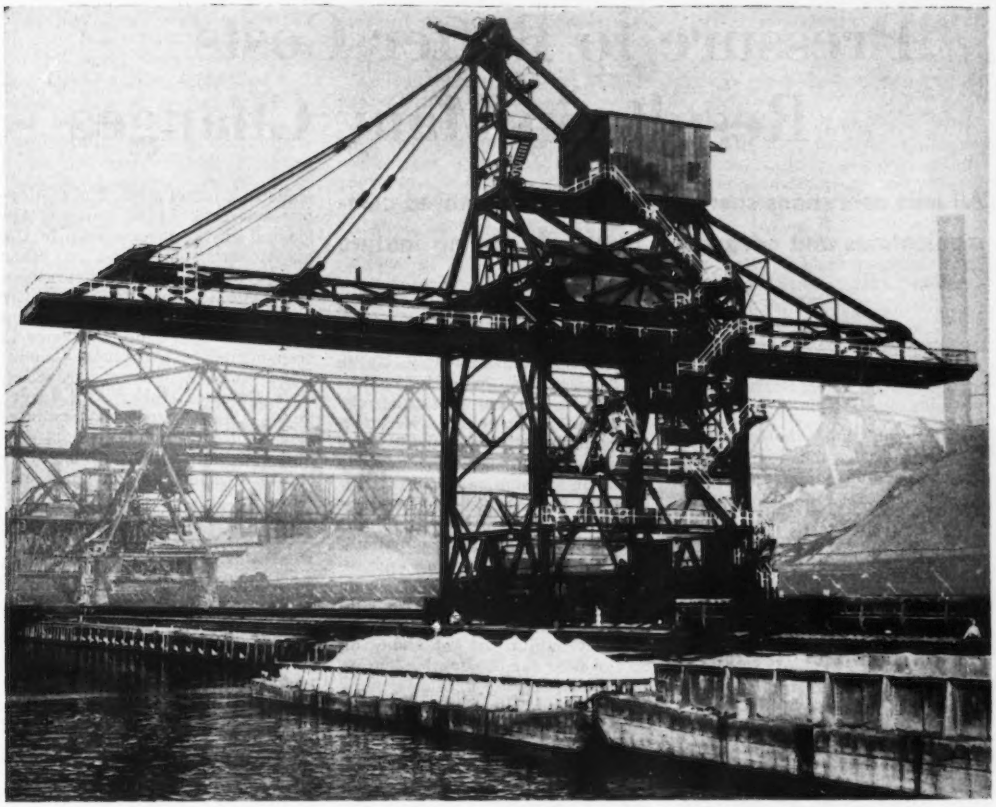
Because little or no flux is added, however, the sulphur content of the iron from the main furnaces is too high; the two smaller 60-ton electric arc tilting furnaces reduce this sulphur content.

Outstanding characteristics of the slag, as observed in pilot plant operation, is its high titanium content—60 to 70%, calculated as TiO_2. Maximum iron oxide content calculated as Fe, ranges from only 2 to 20%; CaO content ranges from 14 to 18%. The total of these two impurities is only 5 to 20%. The slag's good digesting properties under customary commercial conditions of the sulphuric acid digestion process and leaching, lead to the recovery of 80 to 85% of the titanium in the leach solution. Its low iron content, compared with titaniferous concentrates ordinarily used in the past, decreases the amount of sulphuric acid required per pound of output and also obviates the need of removing the iron by crystallization as ferrous sulphate. This cuts down the time and cost of the digestion process and does away with a by-product for which there is little market.

Although part of the titanium will be present in the form of oxides of lower valence than TiO_2, the slag is not highly reduced. This is desirable, for low-valenced titanium has an adverse effect upon the quality of the pigment produced. Because of the reducing action of the coal, low iron oxide content in the slag coincides with large low-valence titanium content. When the FeO content is in the range noted above, the resulting leach solution will contain 1 to 30%, and preferably not more than 15%, of its titanium in the low valent form.

It is the necessity of obtaining a fluid slag, high in TiO_2, with just the proper amount of reduction, which has required the development of a high degree of control over charge composition and furnace operation.

Since a slightly positive pressure is maintained in the furnace, air does not contaminate the gaseous product of the coal used in the smelting reaction. It is 90% CO. Output is 1,100 cfm., containing 300 Btu. per cu. ft. Thus the heating value is about three times that obtained in normal smelting procedure from blast furnace gas, which contains considerable nitrogen from the air. After being cleaned in gas scrubbers, the gas is used for plant heating, ore drying, and other operations. Therefore, the Sorel plant, unlike conventional smelters, makes use of all its products.



ORE-HANDLING will be speeded up with this new unit installed on the East Coast.

New 15-Ton Unloader for Imported Iron Ores

W. B. MacLEAN
Dravo Corp., Pittsburgh, Pa.

A NEW UNLOADER to handle iron ore imported from Liberia and South America, built by Dravo Corp., Pittsburgh, has been installed on the East Coast. For free digging on an average cycle, the clamshell of this unit will be able to transfer 1,100 net tons per hour of iron ore weighing 150 lb. per cu. ft. from the hold of a ship to stockpiles at the dock.

The unloader consists primarily of a 125-ft. all-welded tower built entirely of rolled-steel shapes, and a 210-ft. horizontal runway which is of riveted construction to give the members the necessary high resistance to fatigue. The hinged apron of the unit which can be lowered by hoists over the ore ships is 91 ft. 6 in. long; and the rigid part of the runway which extends over the stockpiles is 73 ft. long. Special precautions such as seal welding of all joints protects the unloader from salt corrosion.

The entire structure is carried on four 8-wheel trucks. All 8 wheels are driven by independent 45-hp. motors. A system of rocker bars and equalizing beams provide for full equalization of the load on the trucks.

A trolley, 12 ft. wide by 34 ft. long, supports a 250-hp. two-motor hoist for the bucket, and two trolley-drive mechanisms powered by 125-hp. motors. A two-story control house is suspended from the trolley. The lower story is the operator's cab, and the upper story houses control boards and resistors.

Two buckets are provided—a 15-ton unit for main digging, and a 7½-ton bucket for small hatches and clean-up work. A turntable on the trolley frame permits rotation of the smaller bucket to suit digging conditions.

The unloader is operated on 230-v. direct current, and all control is of full magnetic type. Limit switches prevent overtravel of the bucket and trolley. Rail clamps are interlocked with drive motors, and the apron hoist control is interlocked with the apron latch to prevent operating errors.

Design speeds of various parts are as follows: tower travel, 90 fpm.; trolley travel, 1,200 fpm.; bucket hoist, 250 fpm.; turntable, 9 rpm.; and apron hoist, 7 min. to hoist.

SURVEY OF MINING PRACTICE—Part II

Pressure to Better Costs Results in Many Changes

All unit operations show effect of spur. Improved communications and advance in blast hole drilling feature surface mining.

A. H. HUBBELL
Managing Editor

Drilling of blast holes underground, blasting, mechanical loading and ground support were discussed in Part I of this Survey, published in the February issue. Other operations involved in underground mining and outstanding developments in surface mining practice are covered in this, the second and final, installment.

Use of Diesel Haulage Is Increasing

More Diesel Equipment Underground. Introduction of diesel mine locomotives into underground mines in the United States proceeds slowly. Some five units appear to be in service (E&MJ, May, 1950, p. 105; also July, 1950, pp. 82, 83, and 126). A sixth is known to be in operation for testing in a copper mine. All are provided with exhaust gas conditioners and in each case the mine ventilation is reported to be good. Locomotive manufacturers have applied to the Bureau of Mines for approval of their locomotive. Such approval does not seem to be necessary at present. Manufacturers of diesel locomotives in Great Britain have evinced interest in the U.S. market.

The Bureau put into print its Schedule 24, entitled "Procedure for Testing Mobile Diesel-Powered Equipment for Non-Coal Mines." This supplements Schedule 22 of six years before. Considerable diesel-driven equipment other than locomotives is in use in underground U. S. mines (E&MJ, July, 1950, pp. 83 and 126) and giving excellent service.

At Sherritt-Gordon's Lynn Lake mine, Manitoba, the use underground of three diesel-driven diamond drills, to supplement air-operated machines and keep load on compressor down, is reported by D. J. MacDonald and A. E. Gallie (C.I.M.M., Bull., Jan., 1951). Ventilation means being limited, the gases, after scrubbing, were exhausted directly into a 4-in. line already hung in the shaft. Tests made at various points in workings for CO showed none present.

A diesel crawler bulldozer equipped with a scrubber, using a solution of hydroquinone and sodium sulphite, for exhaust gases is now being used by International Minerals, at Carlsbad, to clear roadways, stack salt gob and clean up the floor for the Joy loaders on the 900-ft. level.

A paper, "Diesel Locomotives Underground in Tennessee," dealing with the Universal Exploration Co.'s installation at Jefferson City, was presented at the National Safety Congress, in Chicago, in October. The author, F. S. Brophy, is convinced that a diesel locomotive can be operated with safety in underground conditions and that a conditioner is a desirable addition to the engine.

A Tri-State zinc mine, already using diesel equipment, has redesigned a scrubber to suit its units. Gases are diffused through limestone rocks, removing nitrous oxides. Aldehydes are removed by placing several pounds of fine copper wire in the tank. Workings are clear and odorless.

An Ontario mine has a diesel locomotive on order for trial use on its 1200 level. At a Quebec mine, a Hudwood-Hudswell 10-ton diesel locomotive has also been ordered but not yet put in operation.

Better Communications Aid Dispatching

A Southern iron mine has installed the Femco Trolleyphone (E&MJ, Nov., 1947, p. 108) for dispatching ore trains underground over its trolley-haulage system. This is the first installation to be made in a metal mine. The trolley-powered sets, 11 in number, are located on the locomotives, in the dispatcher's office and at other points, permitting conversation with mobile units with all the safety of a permanent telephone system. In operation, the voice is transmitted by a frequency-modulated carrier current traveling over the d.c. trolley and feeder wires. Use of frequency modulation reduces interference and permits conversation despite leaky insulators, sparking brushes and arcs.

International Minerals & Chemical Corp., in its potash mine in New Mexico, has installed automatic current-limiting dynamic braking on its "hill" gathering locomotives. This allows two 20-ton motors operating in tandem to bring down 10 to 12 cars on a 5% to 6% grade. Gross car weight is 9 tons.

Solenoid-operated rail switches have been installed at more important switching points. These have a lighted indicator showing the position of switch and remote-control switches to operate the solenoid so that a switch may be thrown from a motor in motion without stopping or slowing down.

More Conveyors Installed Underground

Cleveland-Cliffs' new inclined installation at the Cambria-Jackson mine is now in use, with results inconclusive. The necessary rock excavation and drifting for a 2,500-ft. flight of 30-in. belt at Mather A is nearing completion. This installation is designed to handle up to 4,000 tons of material per day. At the loading end will be a conventional flowsheet of surge bin, pan feeder, jaw crusher and scalping screen.

International Salt Co., Detroit, has completed its underground conveyor system for moving the salt to the shaft. It will take the place of the tracks, cars and locomotives formerly long used.

Hecla Mining Co., Idaho, installed a shaker conveyor to effect an ore transfer of 215 ft. The ore (zinc-lead with quartzitic gangue)

is highly abrasive and a pan life of only 10,000 tons was obtained. On this basis, the shaker was uneconomical and was removed.

The conveyor system in operation between the lower levels of Pend Oreille Mines & Metals Co.'s mine and new mill at Metaline Falls, Wash., conveys the ore 2,500 ft., "hoists" it 500 ft. It can handle 350 tph., at a belt speed of 450 fpm. The main section is 1,450 ft. c. to c., inclined at 17°, rising 400 ft. vertically. Eight steps of starting are provided for the 200-hp. motor. The belt is 30 in. wide, of 125 compass-cord Goodyear construction. One man operates the system, controlling it from push buttons at the underground loading point. Pend Oreille is the first western lead-zinc mine to have a conveyor between underground workings and mill.

Steep Rock Iron Mines, Ontario, now making an underground layout for its Errington mine ("B" orebody), to produce 1,500,000 tons per year, plans to lift all ore to surface by belt conveyor.

Advantages of Modern Belting

High-Strength Belting Installations Multiply. Increasing use is being made of high-strength conveyor belting underground and on surface in the mining industry. By this is meant belting, the carcass of which is composed of a material able to withstand high-tensile strengths, such as cotton cords, rayon and steel cords; also fabrics combining specially-treated long-staple cotton with nylon, this according to U. S. Rubber Co. engineers.

With such belting, conveyors can be constructed with long distances between head and tail pulleys, high lifts or declines, and greater tonnages can be handled. Before the advent of high-tension conveyor belting, conveyor lines had to be broken up into many short conveyors necessitating transfer from one to another. Using long-center conveyors, much of this transfer is eliminated and much saving is effected in handling cost. Most of the degradation of the material handled takes place at transfer points. It is at these points also that there is the greatest possibility of damage to the belts. A man is usually stationed at the transfer point to see that everything runs smoothly. If the point is eliminated, a comparable saving is made in labor costs. Use of one long conveyor in place of several smaller ones also reduces the number of terminal pulleys, motors, speed reducers, couplings, etc., which cuts the initial expense.

Most high-tension belts have been installed in coal fields, but other types of mining have their share, in this country and abroad.

In Hoist Room and Shaft

Hoist of the Year. Anaconda Copper is installing the big new Allis-Chalmers ore hoist (3,000-hp. motor) at the Kelley shaft that has been an important feature of its Greater Butte Project. Operation will be semi-automatic. This is understood to be much faster than full automatic. The hoist will be started by the station tender at the loading point.

Few new installations have been reported. The New Park Mining Co., Utah, expects to put a new Nordberg hoist in operation this year.

International Salt Co., Detroit, has replaced one 600-hp. hoist motor with two of 500 hp. each to increase its hoisting rate with growing demand.

"Ore hoisting" will be done entirely by conveyor at Steep Rock's new Errington mine ("B" orebody), now being developed for 1,500,000 tons per year. (See also at left.) The man and supply shaft now being sunk will have its headworks entirely in a rock island below ground, with only sheaves and supporting headblock above surface.

Cleveland-Cliffs Iron Co., Ishpeming, is increasing its use of ropes made of galvanized wires, finds that the longer rope life more than makes up for the higher price. (See also E&MJ, Feb., 1948, p. 102.)

Excellent experience in very corrosive upcast atmosphere is related by Wright-Hargreaves, Kirkland Lake, with two 1⅛-in. flattened-strand, 6x27 hoisting ropes made with electroplated drawn galvanized wires (Bethlehem), in its internal vertical No. 5 winze between 3,600-ft. and 7,200-ft. horizons. Examination after 32 months shows corrosion just starting. The ropes are used for hoisting ore and waste in balance and for servicing and handling men. The ropes were laid by Anglo-Canadian Wire Rope Co.

At the Pioneer mine, British Columbia, spots where hoisting rope diameter has substantially increased are detected by the Wear-O-Meter, a device developed by H. K. MacKenzie and said to measure rope circumference (¾ to 1⅛-in. dia.) to the nearest thousandth of an inch.

An inertia-operated "crash" switch is used by Magma Copper, Arizona, in its mine cages to indicate sudden stoppage and prevent the hoisting rope from piling up, thereby saving it from damage.

To permit talking between landings and between hoistman and landings, International Minerals, Carlsbad, N. M., has installed an electronic signal system in No. 2 shaft, handling men and supplies.

The Bottom Dump Skip. The first experimental model of a bottom-dump skip, designed and made by Lake Shore Engineering Co., has been in use in Cleveland-Cliffs' Mather "A" shaft (Ishpeming) for six months or more, with others on order for early delivery. Compared with the conventional Kimberley-type, it cuts dumping time, thanks to a door design like that of a power-shovel dipper, and requires only 7 ft. headroom at Mather "A", compared with 20 ft. Its use eliminates accumulation of material in bottom and subsequent spillage.

At Howe Sound's Holden mine, Washington, study is being given to numerous designs of bottom-dump skips applicable for its new underground shaft.

A front-dump mine-skip assembly said to take relatively little space in the mine shaft has been devised by Arne W. Parkkonen, Negaunee, Mich., and a patent application is pending.

Smoother travel of skips in inclined raises has been secured at Callahan Zinc-Lead's Akron unit, White Pine, Colo., by using rubber tires 10 in. in diameter. These travel on 4 x 10-in. timbers. Roan Antelope's ore skips, Northern Rhodesia, which have bronze guide shoes sliding on steel guides, are now equipped with a self-oiling device.

Pumping and Ventilation

Sludge Removal Up - to - Date. Rhokana Corporation, Northern Rhodesia, according to O. B. Bennett, manager, is settling sludge in a controlled flow, 100 x 7-ft., five-compartment sump, fitted with baffles (like a diamond-drill sludge box). From the apex of a series of inverted pyramids on the sump bottom, a sludge pump removes the sludge at 60% moisture, through a 4-in. pipe; delivers it

to an excavation which serves as filter press and has its entrance sealed by a steel plate, which has two vertical series of horizontal pipes tapped into it. Sludge is then pumped into this filter on day shift, allowed to settle overnight under 3-psi. pressure maintained by compressed air. Clear water is decanted through the pipes next morning until sludge appears. The pipe taps are then closed and the next day's accumulation of sludge pumped in. After three weeks of this routine, no sludge is delivered for 48-60 hr. Clear water is decanted and the settled sludge, containing 20-30% moisture, mucked out. About 250 tons of sludge is so handled monthly.

At Howe Sound's Holden mine, Washington, use of a deep-well type centrifugal pump for cleaning out shaft and pump sumps has proved economically feasible. Granby Consolidated, Copper Mountain, B. C., has eliminated the expense of periodic cleaning of sludge by use of a Byron-Jackson 10-stage deep-well pump on its No. 8 level for handling mine drainage water. It will handle up to 10% solids.

For Better Ventilation

Good Air Aids Output. National Lead, at Fredericktown, Mo., having much diesel equipment underground, has improved the ventilation by adding a 60,000-cfm. fan.

Hecla, in northern Idaho, finds that increased use of standardized auxiliary axial-flow type fans for better ventilation in remote workings has improved the over-all system.

In general, for main mine ventilation, the axial-flow propeller fan is most widely employed. It is appropriate also for "spot" ventilation where no tubing or only a short length is required. For auxiliary ventilation in metal mines the centrifugal type remains most popular.

Matachewan Consolidated, Ontario, having driven 2,500 ft. of drifts and crosscuts, installed an exhaust system of auxiliary ventilation, using a 5-hp. fan. This takes fresh air from the 1550 level and keeps the lower part of the shaft and lower 2280 level in fresh air continually and clears the faces in 20 minutes after blasting.

More attention is being given by Patiño Mines & Enterprises (Bolivia) to ventilation, especially in block-caving areas, to reduce the dust count in working faces.

Corrosion, Abrasion Fought

Effective Substitutes Pay. More and more, corrosion-and abrasion-resisting and weight-saving materials are being used in construction and in making equipment. Mountain Copper, California, is expanding its use of stainless steel underground. Its latest effort is to use stainless-clad 40-lb. rail under loading chutes. To make it, 3/16 x ¾ x ½-in. stainless channel is put on top and 20-gage stainless sheet on web and bottom.

Cleveland-Cliffs gets good results from use of rubber-lined pipe and centrifugal pumps built entirely of stainless steel to combat acid water at its Spies mine, Michigan. Analysis shows 27,200 ppm. dissolved solids, chiefly iron sulphate, 1,100 ppm. free acid (in terms of H_2SO_4) and 1,665 ppm. total acidity. Cleveland-Cliffs is likewise using special alloy hardened plates for chute liners, also rubber increasingly.

In British Columbia, another operator is installing a stainless steel pump to handle acid mine water.

A northern operator finds rock-drill lubricant containing corrosion inhibitor of undisclosed formula effective. On dismantling drills lubricated with it and idle for some time, the parts which normally show rust stains and incipient pitting appear clean and fresh. Imperial Oil Co. is making this lubricant.

Tennessee Copper Co., Ducktown, uses stainless steel tubing in the mine-water pump discharge, also plastic pipe. When corrosion-resistant steel can be had, it is used for tram cars.

Two years ago Sidney Mining Co., Idaho, substituted abrasion-resisting steel plate for mild steel in lining chutes. Up to late December, it has had to be replaced in only one chute. It had lasted for 67,000 tons, compared to 26,000 tons for mild steel in the same chute.

At an Ontario mine, ½-in. 3 x 19 cables, replacing 6 x 9 slusher ropes, have proved more wear-resistant, though less flexible.

An Ontario mining company, seeking to save weight in various items, finds that aluminum shells reduce the weight of Leyner-type drills without cutting their effectiveness and that aluminum scaling bars are an improvement. Aluminum columns and arms on test give promise of good life but swing and dump universal made of the light metal are not satisfactory. Another company tried magnesium in pipe wrenches, but they broke frequently, unable to stand the torque. For some time, though, the miners have used magnesium alloy in oil bottles and found it satisfactory.

Highlights of Surface Work

Better Communications. The radio-communication system recently installed by Chile Exploration at Chuquicamata, on mine locomotives and on some foremen's automobiles, is now almost in complete operation. A mobile-radio system is also in service at Kennecott's Utah Copper pit, Bingham Canyon (E&MJ, Aug., 1950, pp. 96-97). During the year a system, including a base station near shops and 16 mobile stations on cars used by maintenance men, was installed at its phosphate mines in Florida by International Minerals and Chemical Corp. Motorola, Inc., has also developed a two-way pack radio for open-pit work. The range from pack to pack is 2 to 5 miles. General Electric has available mobile radio equipment for communication between wide-spread units.

Long-Distance Pumping Transport. Virginia-Carolina Chemical Co., in the Florida phosphate field has been experimenting for several years to improve pumping conditions between mine and washer. Early adoption of improved equipment is expected. Sufficient advance has been made to enable the use of pipe lines several miles longer than any heretofore used in the field.

Diamond Drilling Advance

Exploration Drilling. Deep-hole diamond drilling has increased in North America, the E. J. Longyear Co. states. Better progress at lower costs has been made, thanks to better equipment and technique.

Sectionalized stationary steel derricks, some of greatly increased height permitting longer pulls, are used more extensively. Mobile equipment likewise can be had with higher folding masts.

Progress has been made in using rotary mud drilling methods for drilling through glacial drift. Portable shale shakers are employed for desanding the recirculated fluid.

Pumping units with a two- or multi-speed transmission are used more often.

Improvements and innovations for deflecting drill holes and con-

trolling their direction are under development.

New core barrels designed by Longyear for good recovery in difficult coring formations are available.

Patrick Adamson, of Wheel Trueing Tool Co., sees the extended use of the impregnated type of core bits under difficult drilling conditions.

With the intent of improving diamond drilling efficiency through standardization of core drill accessories, a Standards pamphlet has been prepared by the Diamond Core Drill Manufacturers Association.

Progress in Surface Drilling

Blast-Hole Drilling. Mr. Adamson also asserts that success has been attained with diamond drills in quarrying or in open-pit work. Citing first the west cut at Raft Lake, drilled with diamond drills in 1943, in diverting the Seine River from Steep Rock Lake, Ontario, he pointed to a more recent job in a quarry at Gaffney, S.C. (Pit & Quarry, Aug., 1950, pp. 93-96).

Excellent results are being obtained with Ingersoll-Rand's Quarrymaster drill. The speed obtained with it permits drilling of a large number of 6-in. holes in a given time, as compared with fewer larger holes, this permitting use of a more advantageous pattern for blasting in many instances.

In mining at Steep Rock Lake today, wagon drills used currently for breaking are being replaced with light Atlas-Diesel machines on jack legs, using carbide-tipped steel and a chisel bit. Both with air-drill and churn-drill blasting, short-period delays are giving encouraging results.

Carbide bits are also improving results with secondary drilling at various places, as in a New York State open pit.

Carbide-tipped steel has been introduced by Ingersoll-Rand under the Carset brand name in two gage sizes for plug and feather holes in quarrying and for maintenance work. It is being made, for use with the light J-10 Jackhamer in ¾-in. gage on ⅝-in. hollow steel and in 1-in. gage on ¾-in. hollow steel, in both 12-in. and 24-in. drilling lengths for each gage. With a specially made adapter it can be used in the (⅞ x 3¼ in.) standard jackhammer.

Soft iron ore and its very hard taconite capping have been broken successfully at the Mary Ellen mine, on the eastern Mesabi after drilling horizontal holes 40 ft. long with Salem Tool Co.'s McCarthy rock boring machine, using a 6-in. coal auger and a carbide-tipped 6½-in. three-pronged auger bit. The same manufacturer's vertical drill is finding favor for putting down holes to aid seismographic study.

A Western magnesite open-cut mine in December, 1950, started using Joy 58-BH rotary blast-hole drills on all primary drilling and sample cutting. Holes are shot with 5¼ x 18-in. DuPont Nitramon, using short-period delays.

Cleveland-Cliffs and other operators are increasing their use of short-period delays in blasting, both for securing great efficiency and reducing the shock wave.

With the aid of milli-second delays at a Western iron mine, the company will be able to shoot blast holes right up to pit lines under pit walls.

In churn drilling the general trend is to larger holes, particularly from 9-in. to 12-in. diameter and from 6-in. to 9-in. The large hole provides more space for explosives and gives better breakage. A small portable blast-hole drill, on crawler mounting, is made by Keystone Driller Co. Churn drill bits of alloy (Ni-Cr-Mo) steel have proved superior for tough ground. The Carset bit is available in 5½-in. and 6-in. sizes and Kennametal has turned out a chopping bit with six carbide-tipped blades that chops through tough formation and returns good samples. Use of the Ajax salt bath furnace for forging and heat-treating has improved operations at a New York State open pit. Compared with the oil-fired type furnace, it gives longer bit life and better drilling.

15,000 Ft. of Hole Pierced

Jet-Piercing at Work. Operation of a taconite pilot plant on the Mesabi Range in 1950, Linde Air Products claims, has proved the effectiveness of the production of large blast holes by jet-piercing. Over 15,000 ft. of hole 6½ in. in diameter or larger have been pierced since the large machine went into operation a year ago.

A manually-operated jet-piercing blowpipe has been developed and is in production operation in a number of quartzite quarries.

Size of Excavators Growing. Trend is to larger shovels and heavy-duty trucks coupled with constant improvement in details of design. Emphasis is placed on the side-dump type of truck by Easton as having great possibilities for transportation improvement. Pursuing the idea, this builder now has more than 30 models available in side-dump trailers and truck bodies, also many types of cars utilizing the same principle for mine and quarry work.

At a New York State mine the installation of a curved bumper block at the crusher permits the truck to dump from any position.

Rubber Tires vs. Crawlers. Wheel scrapers with built-in power are gradually finding acceptance for stripping in mining work. Able to haul material at high rates of speed, they tend to displace the slower tractor-drawn scraper.

Rubber-tired bulldozers likewise exhibit an advantage over the crawler-type of unit by reason of their speed and maneuverability around loading shovels, on dumps and in pits. Moving under their own power, they eliminate the need for special transporting trucks or trailers. They are also useful in road maintenance.

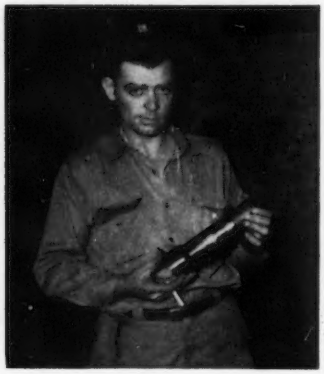
A tower excavator of new Sauerman design, having a 6-cu. yd. scraper, has been in use by Cons. Diamond Mines of S. W. Africa, digging prospect trenches and stripping sand overburden at Orange River Mouth. This work had previously been done by power shovels and sand dredge.

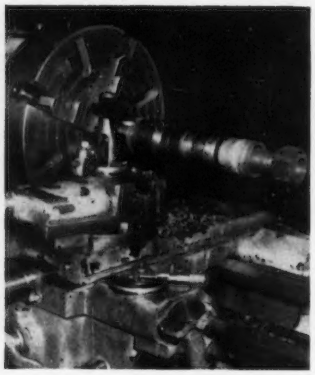
Diesel-Electrics Oust Steam Locomotives

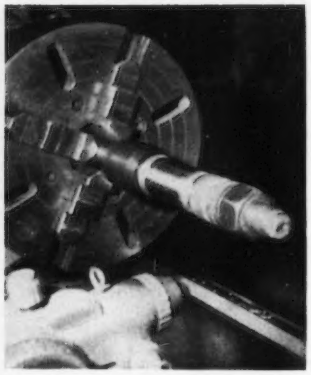
For Rail Haulage. In one porphyry copper pit, diesel-electric locomotives in two sizes have supplanted coal-fired steam locomotives, both in pit work and in hauling from mine to mill. They are 1500-hp. Alco units weighing 125 tons, and 600-hp. General Electric locomotives weighing 70 tons. The former haul eight loaded ore cars up compensated 2½% grades. Ore and waste hauls are 3.5 and 4.75 miles respectively.

Conveyors Multiply. Surface installations of high-tension conveyor belts have been increasing at a rapid rate. (See also p. 81). A wartime lull ensued after the first was installed, ten years ago, at Oliver Iron Mining Co.'s Morris pit on the Mesabi. Such belts are now at work in Chile, according to U.S. Rubber Co., on order for the interior of Africa, on the drawing board for use in mining potash, copper, iron and other materials, and are being considered for handling iron ore in Scandinavia.

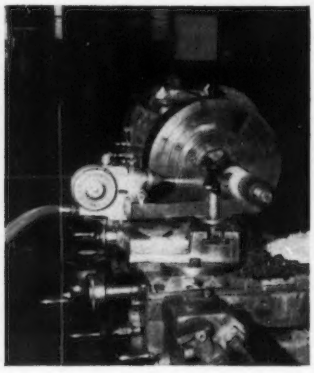
OPERATING IDEAS







EARL SNODGRASS, master mechanic for St. Anthony Mining and Development Co., holds scored pump sleeve (left) which is chucked in lathe and given a rough cut (center). Surface is then rough and clean (right).



THEN SPRAY-BOND coat is applied with metal spray unit (left), after which stainless steel is sprayed on (center). Final step consists of machining sleeve to correct diameter. Note sleeve before and after repair (right).

Master Mechanic Explains Secret of Good Metallizing

The mechanical department of St. Anthony Mining and Development Co., Ltd., Tiger, Ariz., employs metal spraying to repair old or worn parts of mine and mill equipment with great success. This process has resulted in substantial operating savings, and prevented serious shutdowns of some equipment in the past.

For example, pump shaft sleeves formerly lasted only 10 days under rugged conditions at St. Anthony. After sleeves had been metallized and machined, they lasted 42 days. In the mill, a cold rolled steel crusher shaft wore 0.060 in. after the crusher had handled 30,000 tons of ore. After metallizing the shaft, it wore only 0.012 in. for a crusher through-put of 150,000 tons. The cost of metallizing a crusher shaft is only half as much as building a new one.

Other equipment parts restored to usefulness by metallizing includes compressor shafts, deep-well turbine pump rods, piston rods, and electric motor shafts. In general any surface which is subject to rotating motion can be repaired with metallizing, but parts subjected to heavy shock and severe impact will not stand up with metallized surfaces.

In the illustrations above, Earl Snodgrass, master mechanic at St. Anthony, demonstrates typical steps in metallizing a shaft sleeve of a pump. First the worn surface of the sleeve is turned down on the lathe with a rough cut (18 threads per in.). This provides a clean surface on which to apply metal spray. This is of utmost importance. Many mechanics have failed to apply metal spray effectively simply because the surface was not free of all oil and dirt. It is also important that all other directions in metallizing manuals and instruction books be followed to the letter.

Then a spray bond coat (Metco Sprabond) is applied. Next the spray unit is mounted in the tool holder of the lathe, and a uniform

spray coat is applied back and forth across the sleeve surface until thick enough to be machined down to proper size for installation in the pump. The final spray coat is Metcoloy No. 2, a hard stainless steel.

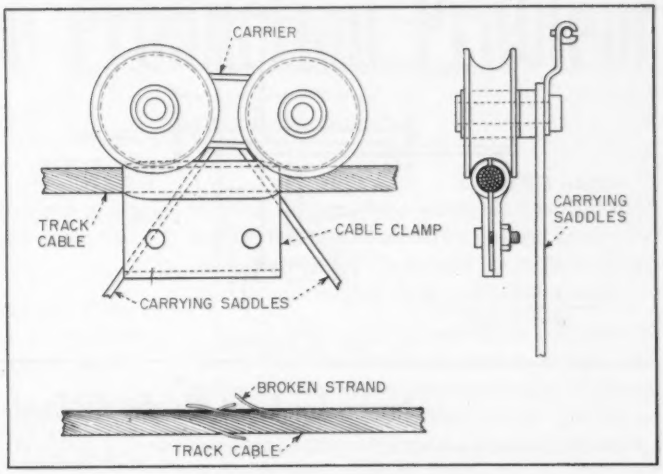
Many kinds of metal can be applied with this spraying technique including zinc, aluminum, babbit, brass, bronze, copper, monel metal, nickel, tin, various types of carbon steel, stainless steel. Metal for this purpose comes in wire form. The spray unit, made by Metallizing Engineering Co., Inc., is designed to draw this wire into the melting chamber as fast as may be required to produce a uniform spray. (See photograph.)

For hard-surfacing parts, Mr. Snodgrass uses Metco Weld-H which is sprayed on and then fused with a torch. This gives a dense hard surface which runs as high a 61 on the Rockwell "C" scale.

Clamp Holds Broken Strands on Tram Cable

Track cables in aerial tram installations are usually of the lock-coil type. Occasionally after lengthy service, a strand or two may break, and when this occurs the loose strands must be forced back in place with some sort of clamp to prevent stoppage of the bucket line. A good clamp for this purpose must be designed to permit quick attachment, and its head must be shaped to offer little resistance to an approaching bucket-carriage pulley or wheel.

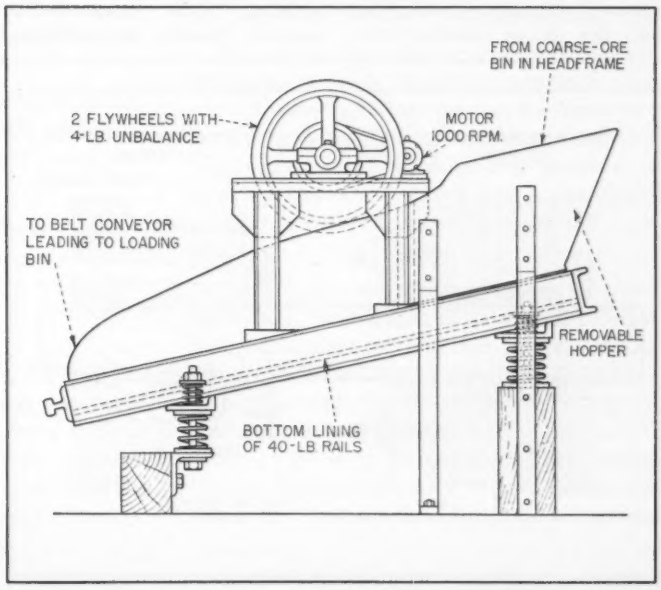
V. Dahlgren, foreman in charge of the aerial tram installed at the Mountain Copper Co. property, Matheson, California, has used the clamp shown here with great success for several years. It is made at the company machine shop from scrap materials. Ends of clamp are tapered down by grinding.

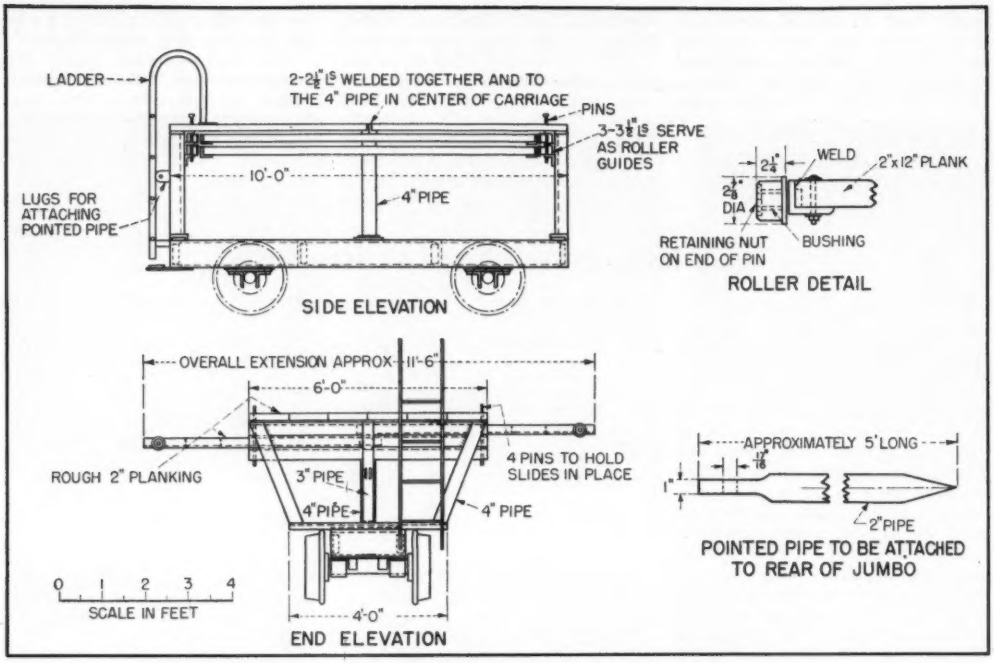


Simple Vibrating Mechanism for Feeder

Keith Kunze, mill superintendent, Central Eureka Mining Co., Sutter Creek, Amador County, Calif., has speeded up the flow of ore from the coarse-ore storage bin in the headframe to the loading bin by equipping the feeder below the storage bin discharge chute with the simple vibrating mechanism shown. It has also eliminated use of hand labor when handling wet or sticky ore. The unit feeds ore from the storage bin onto a conveyor belt leading to the loading bin.

The vibrating mechanism consists of two flywheels; main shaft; two special bearings; and a small electric motor. Cost of the two bearings was $75.00, and the steel springs supporting the feeder proper $10.00. The unbalance on each flywheel is 4 lb., and speed 1,000 r.p.m. Maintenance is low, amounting to about $30.00 a year. The bottom of the feeder is lined with lengths of 40-lb. rail. The removable hopper at the feed end is held by strap-iron supports.


FROM COARSE-ORE BIN IN HEADFRAME
2 FLYWHEELS WITH 4-LB. UNBALANCE
MOTOR 1000 RPM.
TO BELT CONVEYOR LEADING TO LOADING BIN
REMOVABLE HOPPER
BOTTOM LINING OF 40-LB RAILS

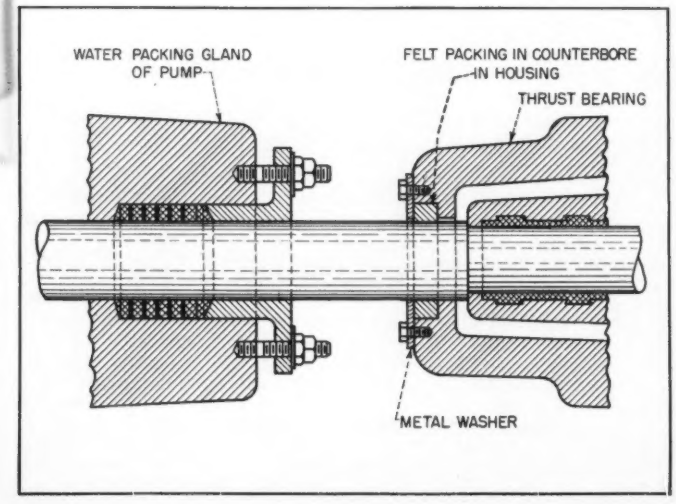


Jumbo for Light-Weight Air-Feed Drills

Three light-weight air-leg drills were used on this jumbo to drill out 8-ft. rounds in 10 x 10-ft. headings at the Copper Mountain, B. C., mine of Granby Consolidated Mining, Smelting & Power Co., Ltd., according to J. A. C. Ross, assistant mine superintendent, who submits this unique operating idea.

The jumbo consists of a platform mounted on a standard carriage. It is equipped with two side-extension, roller-mounted platforms which are extended for setting up and retracted after drilling has been completed. Air and water manifolds (not shown) are mounted beneath the platform.

With this jumbo, three Canadian Copco pusher-leg machines, and an Eimco Model 40 mucking machine, three men are able to average 7 to 7¼ ft. in an 8-hr. shift—a performance which could not be equaled with a conventional 2-machine drill jumbo and automatic drifters.



How to Keep Water Out of Pump Bearings

In a centrifugal pump the water packing gland is usually within a few inches of the thrust bearing situated on one end of the main bearing. Hence water often creeps along the pump shaft and into the bearing, causing oil to float out. This difficulty can be overcome readily by altering the end of the housing of the thrust bearing so that it contains a packing box to exclude water as shown here. The housing is counterbored to form a packing box. When filled with felt packing, it will stand up for a long time, sometimes for a year. If an oil-tight, dust-tight, or gas-tight housing is specified, this chamber can be filled with fibrous metallic packing.

The Defense Production Problem

To win out in the struggle for freedom into which the Russian Communists have plunged us we must do at least four things. We must:

1. Speedily carry through a program of defense production which, at its peak, is scheduled to take about one-fifth of our national output.

2. Pay for this program as we go, by methods that will enable us to maintain the effort for an indefinite period — as long as may be necessary to insure peace and security.

3. Manage intelligently and endure intelligently a set of direct government controls which, in certain critical departments, will put our national economy for a time in a hateful straight jacket.

4. See that these emergency controls are not fastened upon us permanently thereby presenting to our Soviet antagonists a major victory for collectivism on our home front.

This is the first of a series of editorials designed to present in the simplest terms these key aspects of our struggle to preserve our free institutions.

A Staggering Task

The magnitude of the defense production job staggers the imagination. Over the next year it calls for a larger volume of goods and services than the 20 million people of the states of New York and New Jersey will use for all purposes. The (London) TIMES has observed that, taken alone, the increase of defense expenditures which has been budgeted for the federal government's coming fiscal year (about $30 billion) "is in itself not far short of the total national income of the United Kingdom."

Yet so powerful is the production machine created by free American enterprise that, at the scheduled peak, the defense program will take only about one-fifth of our total national output. The exact form and dimensions of the program will, of course, be hammered out on the anvil of public and congressional debate. But the President's recent estimate of an annual rate of expenditure of $45-55 billion for defense by the end of this year may well turn out to be somewhere near right.

To meet even these vast requirements of defense production we are in better shape technically than we were when we started to prepare for World War II. Our industrial plant and equipment is greatly improved. Over $65 billion has been invested in it since V-J Day. Our working force is about eight million larger than it was ten years ago and much better trained.

The difficulty, and it is a very serious economic difficulty, is that we must fit the defense program into a productive machine that has been almost fully extended to meet the needs of a booming civilian demand. The present plan is to step up defense production during 1951 from about 7% to about 18% of our total national output. Because there is relatively little slack in our economy, this means that civilian production at the outset must

be cut back as defense production is stepped up.

The cut-back of civilian goods must be especially severe in the case of products made of metal. This is particularly true of goods that use scarce strategic metals such as aluminum and copper. Of our total defense production program, about half will go for "military hardware" – airplanes, guns, munitions, tanks and the machinery to make them. By the end of 1951 defense requirements are scheduled to absorb most of the metalworking production not required for essential construction and for the spare parts necessary to keep existing equipment running. For a time at least, there will be a sharp cut in the supply of new metal products available to civilian consumers. The defense squeeze on both materials and manpower will also cut sharply into housing and other civilian construction.

For the Short Run — Controls

In the short run there is no answer to the problem of meeting defense production schedules except controls. Sharp reduction of non-defense expenditures by government is essential and would help greatly. But the basic fact is that we cannot increase our total production fast enough to meet immediately both civilian and defense requirements.

Controls are needed, therefore, to switch resources from civilian to defense production, and at the same time prevent the combined demand for critical products from sending prices right through the roof. In the case of many scarce strategic metals such as nickel, copper and cobalt, the task of increasing output is especially difficult because our limited supplies are tucked away deep in the earth in many quarters of the globe.

For the longer pull – and that is what we must face – there is another answer to our defense production problem that is infinitely better than controls. And this time, in contrast to World War II, it is all-important that we get the right answer to our defense production problem for the longer pull and that we get it right now. In World War II we geared our economy to meet the requirements of a relatively short and decisive conflict. Now our leaders, however they may differ as to methods, are well agreed that, at best, "the conditions under which we labor may persist for ten, fifteen or twenty years." That is General Bradley's phrase.

For the Long Pull — More and Better Production

For this longer pull, the constructive answer to our problem of defense production is clearly more and more efficient production all along the line. It is true that overall we now have the most efficient industrial establishment in the world. But, even so, much of it is far short of attainable efficiency. Some plants using up-to-date equipment and methods are as much as six times more efficient than others in the same industry that are lagging in modernization.

Our Director of Mobilization, Charles E. Wilson, has clearly in mind this problem of increasing our industrial efficiency. The first step in his job, as he conceives it, is to get out an adequate supply of weapons to equip the army, navy, and air forces already mobilized or in process of organization by us and our allies. The second step is to make sure of our capacity to produce both "military hardware" to meet any increased requirements and the maximum possible volume of goods for civilian use.

In concentrating on more and more efficient production, Mr. Wilson is squarely on the beam. We can attain his objective – by sustained effort on the part of each one of us backed by up-to-date industrial methods and equipment.

If we do that, we can maintain indefinitely an adequate defense effort and at the same time enjoy a standard of living higher than any other in the world.

Additional production and more efficient production are our surest safeguards against our two most menacing enemies on the home front – the deadly inflation that can destroy our free economy, and the strangling government controls that can destroy our political freedom.

McGraw-Hill Publishing Company, Inc.

MARKETS—Trends and Prices (*Continued from page 53*)

U. S. Refined-Lead Statistics

(American Bureau of Metal Statistics)

Production, shipments, and stocks of refined lead as reported by all of the primary refineries operating in the United States, in tons:

	Stock at Beginning	Production Primary and Secondary	Total Supply	Stock at End	Domestic Shipments
1946	44,867	396,688	441,555	47,587	393,904
1947	47,587	541,065	588,652	21,328	(a)566,666
1948	21,328	511,356	532,684	36,644	490,630
1949	38,644	542,676	581,320	70,424	355,905
1950					
January	70,424	47,512	117,936	76,529	25,683
February	76,529	41,670	118,199	79,143	(b)21,855
March	79,143	49,104	128,247	88,581	22,358
April	88,581	48,196	136,777	86,309	33,751
May	86,309	48,989	135,298	76,236	45,702
June	76,236	44,490	120,726	69,025	35,774
July	69,025	41,520	110,545	67,809	41,188
August	67,809	47,242	115,051	67,495	47,031
September	67,495	49,958	117,453	61,042	55,898
October	61,042	54,123	115,165	50,854	62,138
November	50,854	50,725	101,579	40,910	58,658
December	40,910	48,234	89,144	35,619	49,601
Totals	.....	571,763	642,187	.....	499,637

In instances where the figures are not in balance, it is due to shipments other than domestic consumers. Includes some secondary lead that it is impracticable to separate statistically month by month.

(a) In addition 560 tons was exported. (b) In addition 63 tons was exported.

Official London Prices

The British Ministry of Supply continues to fix delivered prices of copper, lead and zinc for the United Kingdom. Quotations in effect as February ended were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	202	0	0
Fire refined, high conductivity	202	0	0
Fire refined, high grade	201	10	0
Fire refined, min. 99.7 percent	201	0	0
Fire refined, min. 99.2 percent	200	10	0
LEAD:			
Soft, foreign duty paid	136	0	0
Soft, Empire	136	0	0
English, refined	137	10	0
ZINC:			
Foreign (G.o.b.) duty paid	151	0	0
Domestic (G.o.b.) duty paid	151	0	0
Prime Western and debased	151	0	0
Refined and electrolytic	155	0	0
Minimum 99.99 percent	157	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

February 28, 1951

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload in cases	45.280
Bismuth, ton lots, lb	$2.25
Cadmium, commercial sticks, delivered, lb	$2.55
Calcium, 1 lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb	$2.10
Indium, troy oz	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	50½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz	$24.00
Platinum (Official quotation wholesale lots) troy oz	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$215 @ $220
Selenium, 99.5 percent, lb	$3.00
Silicon, minimum 97 percent, spot, carloads, lb	16.50c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$12.50
Titanium, 96 to 98 percent, lb	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10 to 12% BeO, per unit	$28.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3, no ratio	$24.00 @ $25.00
48% Cr_2O_3, 3 to 1 ratio	$38.00 @ $48.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$218.42
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, 92 @ 96c., c.i.f. U. S. ports, duty extra. Long-term contract quotations wholly nominal and matter for negotiation.	
Molybdenum Ores, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb	$2.00 @ $2.50
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, duty paid	(a) $73.00
Domestic, scheelite, 60 percent f.o.b. mine	nominal
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$115.00

(a) Nominal.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	6½c.
Cobalt Oxide, 72%, metallurgical grade, per lb. of Co	$2.25
Copper Sulphate, 100 lb	$8.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$185.00
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$3.25
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$75.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00 @ $107.00
Paper stock	$68.50 @ $85.00
Waste	$51.00
Refuse or shorts	$25.50 @ $46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.25 @ $9.50
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	$18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2, ton	$43.00
Acid 97% concentrate, bulk, ton	$50.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 70 to 75c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.40 @ $1.50; 3 x 3 inch, $1.70 @ $1.80; 3 x 4 inch, $2.10; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $120 @ $130 per ton. Bulk sales, dry ground, $32.50 @ $60.00 per ton. Scrap, $30 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a) 12 @ 14c.
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structual shapes, 100 lb	$3.65

WASHINGTON REFLECTIONS

Exploration To Get $10,000,000 Stimulation

Owing largely to the efforts of Dr. James Boyd, Defense Minerals Administrator, and Senator Joseph C. O'Mahoney, small mining enterprises will have access to a fund of $10,000,000 to stimulate exploration and development of strategic and critical minerals. The money will come out of the $600,000,000 fund the Defense Production Administration already has available for stimulating defense industry at large.

Rules governing distribution of the exploration aid fund will be drawn up by Defense Minerals Administration, and the Secretary of the Interior will supervise the program.

As approved by Interior Secretary Chapman, the program will include making contracts for exploration on a project-by-project basis. Prospectors must match Government money 50-50, except for particularly scarce minerals, in developing which the Government may take all the load. Any profit earned by use of these funds, may be used to repay Uncle Sam on terms fixed by the Secretary of Interior.

Contracts will call for monthly reports on progress, and field checks will be made by Government engineers and geologists. The program is expected to be followed up by a much larger-scale exploration-aid campaign in the next fiscal year.

Renegotiation Exemption Restored by Senate

An important segment of the mining industry was very much annoyed when the House modified the Renegotiation Act of 1951 (H. R. 1724) to limit the exemption on mineral products to contracts with actual owners or operators of mines and to the "first commercially marketable product." It was felt that this limitation would greatly complicate renegotiation problems and would discourage the aggressive attitude toward mineral development so necessary to a successful defense effort.

The Senate Finance Committee, however, has altered the bill to eliminate these restrictions. The present language of the bill exempts operators up to the ingot or merchantable oxide stage of metal processing.

The bill, of course, will still have to pass the Senate and conference with the House.

Copper Tariff Issue Is Deadlocked

Four pending bills — two in the House, two in the Senate—would order a moratorium on the 2c. a lb. copper tariff. But no hearings have been called by either the Senate Finance Committee or the House Ways and Means Committee. Opponents say introduction of the bills was just a case of going through the motions. Even proponents don't expect much action.

In the background is a reluctance in the State Department to push any special tariff legislation this session if it can help it. Reason: the flare-up when the House was asked by the Administration for a three-year renewal of the Reciprocal Trade Act.

Nevertheless, there is influential pressure for another waiver of the copper tariff—but not enough to overwhelm Senator McFarland of Arizona, who is Senate Majority Leader and up for re-election two years hence.

Mineral Expansion Programs Stalled

Here's a quick look at programs to help the mining industry meet mobilization needs:

Loans: About 500 applications on hand in Defense Minerals Administration, mostly from small operators and for exploration. No loans approved at this writing.

Purchase contracts: One was signed for manganese and several for aluminum some time ago, but none in recent weeks. Negotiations are under way for copper, chrome, tungsten, molybdenum, zinc, lead, mica, and beryllium.

Amortization of investment: Somewhat under 100 applications for accelerated amortization have been received. None has been approved.

Exploration: DPA has approved spending $10,000,000, under Interior's direction, to help exploration for strategic and critical minerals.

In short, the loans, contracts, and tax amortization agreements, which are designed to broaden the base of minerals production, haven't outgrown the red tape phase.

To understand the delay, it's necessary to understand the line of authority. Defense Minerals Administration is the operating agency which negotiates, recommends and passes projects up the line for final approval. It's plagued with manpower shortages and by lack of clearly defined policies handed down from the top mobilization authorities. So far, DMA has had to feel its way. Every application requires detailed negotiation.

However, the operating heads in DMA believe a good many loans and purchase agreements, in particular, are close to the final okay.

Mining Equipment Help Is Catch-as-Catch-Can

When a mine operator gets new equipment or major repair parts these days through Government help, it's not the result of any well-oiled, smoothly-operating bureaucratic machinery in Washington. It's because Harold A. Montag, chief of the Requirements Division of Defense Minerals Administration, has been able to get the needed equipment on a spot relief basis.

The bureaucratic machinery, in fact, has ground almost to a halt. The reasons are: weight of paper work in the National Production Authority divisions, the degeneration to the point of paralysis of the priority scheme, and lack of clear directives from the top mobilization bosses about mine equipment.

Montag is an old hand in the mining machinery priorities business. In 1943-46 he was chief of the Program Section of the mining division of WPB. The feeling in DMA is that he is working through the present snags, and that a system of handling mine equipment needs on a broad basis will shortly be in operation.

Maintenance: NPA has issued authority for business firms to issue their own "DO"s for maintenance, repair, and operating supplies(and small capital items) up to a base-period dollar volume.

Foreign Economic Problems to ECA

William C. Foster, head of the Economic Cooperation Administration, has been named by Charles E. Wilson to set policy on foreign requirements.

Foster's first job is to present Wilson with an idea of what volume of exports must be kept moving. Under the direction of the Commerce Dept. foreign service staffs abroad have been increased in order to keep a steady flow to Washington of information on essential requirements.

Foster's second job will be to form a single operating agency—like the Foreign Economic Administration of World War II—to handle all U. S. economic operations overseas. The agency will probably be built around Foster's own ECA. New functions will include:

Development: The agency will ab-

sorb the Point Four program and forthcoming development aid to South Asia, including the $200-million food for India program. Strategic materials development, now split between ECA and Point Four will be united under the new agency.

Raw Materials: The new agency may serve as U. S. representative on the Central Group and the commodity sub-groups of the new inter-allied raw materials pool.

Export Priorities: The agency's toughest job will be to get U. S. suppliers to take foreign orders on a priority basis. Officials expect to be issuing export priorities within a month or two. But the effectiveness of the priority system itself, is not regarded as a "good bet" until a Controlled Materials Plan is actually working.

Depletion Allowances Will Not be Cut

Treasury Secretary Snyder—in requesting $10-billion more in taxes—has once again asked Congress to cut depletion allowances for metal and mineral producers. Even at this early date, it is apparent what the lawmakers' answer will be: a flat, resounding, "No!"

Congress refused to tamper with the current schedule of allowances in normal times. Now with demand for minerals zooming, Treasury requests will get practically no consideration at all.

U.S. Will Not Release Stockpile Mercury

Contrary to rumors, the Munitions Board has no plans to release any quantity (one rumor said 7,200 flasks) of mercury to Monsanto Chemical Co. for its chlorine plant at Muscle Shoals.

A Munitions Board spokesman says that release of any stockpiled material can be effected only when the item is extremely important to National Defense and can be obtained from no other source or in no other way.

Such is not the case with mercury, of course, which can be bought (at high price, it is true) from Italy, Spain and elsewhere. Also, there is at least one domestic producer and a number of closed mines which could be re-opened and apparently will be shortly.

The Defense Minerals Administration is planning to get some mines back into production. DMA officials met last week with a number of mining firm officials. Their firms during War II produced about 80% of total U. S. supply. They told DMA they could re-open their mines if the U. S. would help underwrite cost of rehabilitation and also guarantee a market a minimum price for from two to four years.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

MINE-MILL: House Un-American Activities wants to know: What's become of left-wing union leaders kicked out of CIO? Watch for investigation of Mine, Mill and Smelter Workers and possible Justice Dept. move against Maurice Travis, Mine-Mill secretary-treasurer.

COMMUNISTS: New party line is to concentrate on boring within right-wing unions, rather than isolating the left-wing in a separate federation. Communist Labor Secretary John Williamson passes the word: "The main direction of our trade union work must be among the members of the reformist-led (right-wing) unions."

NON-FERROUS WAGE BOARD: Wage Stabilization Board is cool, right now, to another Non-ferrous Metal Commission such as functioned in Denver during the war. Short of war, none will be set up.

WAGE POLICY: The 10% over January 1950 allows for cost-of-living increases. Ceiling may be raised in May to reflect rise in living costs. Higher pension and fringe costs taken on since Jan. 25 must be charged against the 10% formula. WSB will study pensions and welfare plans with special policy in mind for them.

WAGE MAGNET: Higher wages, above ceiling, will be allowed when necessary to attract workers to key defense industries in areas of labor shortage. However, Government production and manpower agencies must certify the need. In this, WSB will be more liberal than War Labor Board was. Reasons: Labor is tighter than wartime; wage controls have come at the outset, before labor had a chance to shift.

MANPOWER POLICY: AFL and CIO fear quicker job freeze, tighter deferment policy with manpower policy in Wilson's ODM instead of Tobin's Labor Dept. They think Gen. Lucius Clay will dominate Wilson's manpower assistant, Arthur S. Flemming, give preference to military in demand for skilled workers.

Wilson must go! That is Big Labor's price for full co-operation in mobilization. Union leaders won't feel at ease until he is out as defense mobilizer. Right or wrong, they feel he is anti-labor.

DEFERMENTS: Tobin is losing out on getting liberal draft deferments for metal miners and skilled industrial workers. Pressure is increasing for drafting most able bodied men 19-25. It's mostly political, to make 18-year-old-draft more palatable.

DRAFT IMPACT: Arizona Small Mine Operators Association has studied impact of different draft age brackets on copper, lead, and zinc mining in that State. Here is table of draft brackets showing effect on percent of miners and percent of Arizona production:

Age Bracket	Per Cent Miners Affected	Per Cent Drop in Production
19-25	12	8
25-30	17	15
30-35	18	24

MERCURY MINING: Serious labor shortage seen in months ahead. Four out of five principal operators have closed. These and smaller mercury mines must be reactivated, Washington insists. About 2,500 worked the mercury mines at World War II peak. Shortage soon may reach 1,000 or 1,500.

NON-FERROUS SHORTAGE: In next year, 10,000 more non-ferrous miners will be needed. That's conservative estimate.

THE BREAKDOWN: 1,000 for mercury mines; 4,000 for expansion, new and reactivated copper, lead, and zinc mines; and 5,000 for replacements.

DISPLACED PERSONS: Bureau of Mines finds more mine operators becoming interested in displaced European miners. Displaced Persons Commission has been asked to get up inventory of number available, experience, and countries they come from. Using displaced workers involves: (1) transportation from port to job; (2) having housing available; (3) more responsibility than with native workers.

KENNECOTT: Four unions—Mine-Mill, Steel Workers, Electricians, and Independent Union of Non-ferrous Clerical and Technical Workers—want bargaining rights at Kennecott's electrolytic copper refinery at Garfield, Utah.

LABOR SPY: Labor espionage would be made a crime, punishable by $5,000 fine and two years in jail, under a bill introduced by Sen. Murray of Montana. What is labor spying? Making or receiving a verbal or written report involving collective bargaining or other legitimate worker activity with intent to interfere with those rights. It doesn't have much chance of passage.

PERSONAL NEWS

C. N. Schuette, consulting and metallurgical engineer, who maintained offices in the Sharon Bldg., San Francisco, Calif., for many years, is now practicing at 6390 Barnett Valley Rd. W., Sebastopol, Calif.

Alcoa Mining Co. has announced the removal of its offices to 230 Park Ave., New York City.

FRANK R. MILLIKEN, assistant manager of the Titanium Division of National Lead Co., received the Robert H. Richards Award for achievement in the minerals industry. The award, sponsored by the American Institute of Mining & Metallurgical Engineers, was presented at the annual banquet in St. Louis on Feb. 21 for "outstanding accomplishments" in advancing the technique of the metallurgy and beneficiation of titanium-bearing ores and in the field of mining management.

Donald R. Seals, formerly mining engineer at Climax Molybdenum Corp., has resigned to join the U. S. Army.

L. B. MANNING, Philipsburg, Mont., manager of the Trout Mining Division of American Machine & Metals, Inc., was elected president of the Mining Association of Montana for 1951. He succeeds O. P. Chisholm, who was elected a member of the executive committee.

Thomas K. Graham has been appointed superintendent of the electrolytic zinc plant of Anaconda Copper Mining Co. at Great Falls, succeeding **C. E. Van Blarcom,** who has accepted a position in the East.

R. E. Brooks has retired as general manager of the Butte, Anaconda & Pacific Railway, a subsidiary of Anaconda Copper Mining Co. He has been succeeded by **F. W. Bellinger,** superintendent of the railway.

Clarence O. Mittendorf, who has been director of industry and mining of the ECA mission in Turkey, has been appointed director of the Production Expansion Division of the Defense Minerals Administration. On loan from the ECA, he will help in the formulation of DMA policies to encourage the output of metals and minerals in short supply in the United States. Mr. Mittendorf received his mining education in California and served as miner, mine operator and executive, as well as in various capacities with the Government during World War II.

Frank V. C. Hewett, mining engineer, has been appointed director of the non-ferrous metals division of the Department of Trade and Commerce in Canada.

C. R. Bellows, mine geologist at the Tamarack mine of Day Mines, Inc., in the Coeur d'Alene mining district, recently completed work for the Kromona Mines Corp., located in the Sultan Basin mining district, Washington. Before taking a leave of absence to do this work, he was mine geologist at the Day Mines company Dayrock mine.

A. H. Moken is now reduction manager at Van Dyk Cons. Gold Mines, Ltd., Boksburg, Transvaal, South Africa. He was formerly mill superintendent at Zwartkop chrome mine.

Francis M. Aimone, who was formerly in charge of the Casapalca concentrator of Cerro de Pasco Copper Corp. in Peru, has joined the staff of the mineral dressing laboratory of American Cyanamid Co. at Stamford, Conn. Mr. Aimone is a native of Cobalt, Ontario, Canada.

Lee E. Tucker, metallurgical engineer, has retired after 28 years with the American Cyanamid Co. He will continue to do consulting work with headquarters in Phoenix, Arizona.

New faces in Defense Minerals Administration are **Philip Bradley,** San Francisco, **Franklin Pardee,** Michigan Geological Survey, **Landon Strobel,** Washington, D. C., and **Tom Lyon,** Salt Lake City. The latter replaces **J. K. Richardson,** who is returning to Salt Lake City after completing his tour of duty.

Otto T. Englehart, president of The Beryllium Corp., has announced the resignation of **Birnie V. Edridge** as treasurer of the company, and the appointment of **Frank A. Else** as comptroller.

JOHN G. MUNSON, vice president, raw materials, United States Steel Corp. of Delaware, now merged into U. S. Steel Co., retired Jan. 10. He had been associated with the company for 30 years and had held the position of vice president since 1939.

H. R. Rice, who for the past three years has been an associate editor of Canadian Mining Journal, has recently been appointed an editor. He is a graduate of Queen's University and formerly was associated with Roan Antelope Copper Mines in Northern Rhodesia. He also was engaged in developing gold mines in Hyderabad State, India, for John Taylor & Sons.

ALBERT J. BERDIS, assistant general superintendent of the Irvin Works, U. S. Steel Co., has been appointed general superintendent of the Fairless Works, the new, wholly-integrated plant the company recently announced it would build near Morrisville, Pa.

J. D. McKichan has resigned from the position of ventilation and dust control engineer with the Britannia

Mining & Smelting Co., Ltd., to become ventilation engineer with the Industrial Health Laboratory of the Department of National Health and Welfare, at Ottawa, Ont. His work will concern the correction of health hazards in industry through the use of ventilation.

Allen W. Pinger, formerly geologist for the New Jersey Zinc Co., at Franklin, N. J., has resigned. He has moved to Salt Lake City, Utah, where he will continue doing geological and geophysical work on a part-time basis with New Jersey Zinc Exploration Co. He also plans to do consulting work.

Carlton H. Rose has been named manager of National Lead Co.'s Washington, D. C., office.

Newly-elected officers of the Minnesota Section of the American Institute of Mining & Metallurgical Engineers are: **Grover J. Holt,** chairman; **Hugh Leach,** first vice chairman, and **W. M. Matheson** and **E. F. Pfleider,** vice chairman. **D. M. Davidson** was re-elected secretary-treasurer.

Francis H. Brownell, who served as chairman of the board of American Smelting & Refining Co. for 17 years, retired Dec. 26. Mr. Brownell joined AS&R in 1903. Six years later he became president of the Federal Mining & Smelting Co. He was made a director of AS&R in 1916 and vice president and general counsel the following year.

Robert M. Haskell, superintendent of the mill and reclamation plants of the Calumet division of Calumet & Hecla Consolidated Copper Co., retired Jan. 1. He is being retained on special assignments, particularly in the ore dressing and beneficiation field. **Robert K. Poull** has been appointed general superintendent of the Torch Lake production area and **George McNickel** as mill superintendent.

H. N. How, president of Western Machinery Co., San Francisco, has been named to serve on the Advisory Committee on Mining Machinery in Washington, D. C. The committee has been formed to assist the Defense Minerals Administration and the Defense Solid Fuels Administration with respect to mining machinery.

J. W. Woomer, consulting mining engineer of Pittsburgh, Pa., and Wheeling, W. Va., is spending several weeks in France and Germany observing potash mining practices and potash metallurgy. He is on an assignment for Southwest Potash Corp. of New York City.

Ralph Adair, until recently chief engineer of the North Carolina State College Minerals Research Laboratory, at Asheville, has opened a consulting office to specialize in the beneficiation of non-metallic minerals.

D. H. Besten, chief metallurgist for Aluminum Company of America's reduction plant at Vancouver, Wash., is chairman of the Oregon section of American Institute of Mining & Metallurgical Engineers for 1951.

Correction

Survey Was Even Better Than We Said!

In our January issue, page 132, we reported details of a remarkable survey accuracy achieved by members of the Silver Dollar and Hecla engineering departments. Through a typographical error we reported that the error of closure in latitude was 8.20 ft. It should have been 0.20 ft. Our apologies to the survey crew, also our congratulations for achieving a degree of accuracy of 1/25,208 in horizontal closure, which is good surveying in any man's language.

E&MJ Salute For Outstanding Service

W. L. ZEIGLER

A PIONEER AMONG MILL MEN, W. L. Zeigler, general manager of Pend Oreille Mines & Metal Co., Metaline Falls, Wash., has seen gravity concentration give way to flotation and heavy-density methods bring back gravity again during his 40 years of active participation in milling technology. His experience in designing and building mills well qualified him for his present job, in which he has supervised installation and construction of the new 2,400-ton concentrator and mine surface plant, including incline equipped with conveyor.

Many parts of the world have benefited by his practical contributions to milling technology, including North Africa, where he aided in the installation of a Sink-Float and flotation plant at Zellidja Mines; Bolivia, where he served as design consultant for construction of a 4,000-ton plant for Patino Mines; Alaska, where be built a flotation mill for the Ladysmith Smelting Corp. in 1920; and in Canada, where he participated in the installation of a number of flotation and cyanide plants.

His progressive interest in Sink-Float technology during the late 'Thirties resulted in the installation of a pilot plant at the Star mill at Burke to make tests on Coeur d'Alene ores. This research led to the addition of Sink-Float to the Bunker Hill flowsheet, and to the construction of the Osburn tailing plant, which yielded many thousands of tons of badly needed metals during World War II.

Born in Moscow, Idaho, Mr. Zeigler received his early education there, attended preparatory school and the School of Mines at the University of Idaho, where he received a degree in mining engineering in 1910. He began his career in the Coeur d'Alene district by working in the mines during vacations.

Following graduation, he spent two years at the Monarch mine in northern British Columbia, after which he returned to Wallace, Idaho, to become superintendent of gravity concentration at the Success mine. While there he designed and built several gravity concentrators with flotation as finish process on the tailings. During the years 1918-1924, he built a mill for the Sunset Copper Co. in Washington; managed the Loon Lake Copper Co.; designed and constructed flotation concentrators for various other companies.

Mr. Zeigler was appointed mill superintendent for Hecla Mining Co. in 1924. It was there that he built a tailing flotation mill, the first attempt in the Coeur d'Alene district to grind and treat jig tailings. The next year he added selective flotation to the Hecla gravity mill and since has designed and constructed a large number of mills in the Coeur d'Alene district.

After his appointment at Hecla the Star mill was designed and constructed. This mill is unique in that it occupies a minimum of space and consists of very large grinding units which made the design in its location possible. It is considered a structure of beauty and since its construction in 1936, there have been practically no changes made.

After the Sullivan Mining Co. financed the development and construction of the Reeves MacDonald mine and mill and the expansion program of the Pend Oreille Mines & Metals Co., Mr. Zeigler was transferred to his present position at Metaline Falls in 1948.

Raymond C. Gaugler, who has served as executive vice president of American Cyanamid Co. since 1947, has been elected president to succeed the late William B. Bell, who died suddenly in December. Mr. Gaugler joined the company in 1917 as a member of the accounting department. He has been a director of the company since 1929.

W. A. Rukeyser has just returned from a five weeks' trip to Europe and Africa during which he spent one week in London, two weeks in the Gold Coast examining manganese and industrial diamond deposits, and approximately two weeks in Morocco on the asbestos deposits of Omnium Nord Africain.

Edwin Sweetman, mining engineer of Green Bay, Wis., recently attended a meeting of owners of the Minneapolis Nicollet Hotel which was held at the LaSalle Hotel in Chicago.

OSCAR STRAUS, treasurer of American Smelting & Refining Co., has been elected to the board of directors of the company.

Dr. Charles F. Park, Jr., dean of the School of Mineral Sciences at Stanford University, has gone to Japan where he will spend three months doing mine examination work for the United States Army.

H. B. James, placer mining engineer of San Francisco, has returned to the United States from Brazil, where he has been for the past year. While there he was engaged in the examination of gold placer deposits for C. H. Thurman & Associates, owners and operators of several California gold dredges.

Dr. Randolphe William Diamond, vice president and general manager of the Consolidated Mining & Smelting Company of Canada, Ltd., has been awarded The Institute of Metals (Platinum) Medal for 1951. The award was presented in January in recognition of his outstanding services to the non-ferrous metal industries in connection with researches on differential flotation as applied to the complex Sullivan ore, and as manager of the largest combined copper and lead producer in the world.

ALLEN H. ENGELHARDT has arrived in La Oroya, Peru, the center of operations of Cerro de Pasco Copper Corp., to take over his new duties as assistant manager of operations under A. R. Merz, manager of operations. Mr. Engelhardt has been associated for the past 20 years with South American Development Co. and its various subsidiaries, now terminating its operations, and rose from his first job as shiftboss to resident manager and vice president.

Correction

Through a combination of circumstances, E. L. Longmore, general manager of Hollinger Consolidated Gold Mines, Timmins, Ont., was improperly quoted in the statement about Hollinger's experimental use of carbide-tipped steel and airleg-mounted light drills, which appeared on page 88 of the January, 1951, issue of E&MJ. Mr. Longmore had not seen that statement. The correct picture respecting Hollinger's experimental use of carbide-tipped steel is as follows:

"Drilling costs with carbide-tipped rods are considerably higher in average ground than those obtained with Hollinger steel detachable bits and standard drills. In hard ground, steel costs are about squal, as between tipped rods and Hollinger bits and rods. Under no conditions so far encountered have carbide-tipped rods shown a reduction of drilling costs. The main factor is the high cost of the tipped rods themselves.

"Regarding light machines, appreciable savings in drilling costs have been found possible with one man operating instead of two with the Leyner equipment. However, this does not bring in the question of rods and bits used, for steel bits have been used with Jackleg machines here, with favorable drilling costs. No 'general reduction' in drilling costs is anticipated in the near future by the use of carbide-tipped rods. The use of the light drill, with some type of detachable bit, holds the greatest promise."

James P. Caulfield, general superintendent of Hudson Bay Mining & Smelting Co. and general manager of the Hudson Bay Exploration & Development Co., has been named manager of the Utah Copper Division of Kennecott Copper Corp. He takes over the position formerly held by **Louis Buchman,** general manager of the western division, who will continue to make his headquarters in Salt Lake City. Mr. Caulfield is a native of Butte, Mont., and was graduated from University of Utah in 1923.

OBITUARIES

Andrew W. Newberry, 67, mining engineer, of Wheeling, W. Va., died Feb. 3. He was educated at Cornell, of which his grandfather was cofounder and first president. He received his master's degree in mining engineering from Columbia University School of Mines. Before moving to Wheeling five years ago, he was a Government adviser on foreign minerals.

ROBERT C. STANLEY, chairman of the board of International Nickel Company of Canada, Ltd., died Feb. 12 at his home in Dongan Hills, Staten Island, N. Y. A native of New Jersey, he was a graduate of Stevens Institute of Technology, and received a degree of Engineer of Mines at the Columbia School of Mines. He joined the International Nickel Co., at Bayonne, N. J., in 1901, serving in various capacities until 1918 when he was elected vice president in charge of operations. In 1922 he was elected president of the company, which position he held until last year, when he was named chairman of the board.

James Ralph Finlay

James Ralph Finlay whose death occurred Jan. 2, was born in Blenheim, Ont., Can., on Sept. 30, 1869, the son of Ralph Spence Finlay and Anna Rankin, both of Scotch-Irish descent. At the age of nine his parents died and he went to live with an uncle at Colorado Springs. He attended Colorado College at Colorado Springs and in 1891 received an A.B. from Harvard.

While attending Harvard Finlay

worked in the mines in Colorado during vacations and also examined some gold properties in Nova Scotia. He also worked with geological survey parties in Colorado during vacations. In 1891 he was employed by the Michigan Land & Iron Co. to run a geological survey in the upper peninsula in a search for iron ore deposits. He did exploration work on the Mesabi iron range and discovered an iron float which afterwards proved to be exactly over the great Sauntry-Alpens mine of the Oliver Iron Co. In 1894 he worked as mining engineer for the Minnesota Hard Ore mine at Tower, Minn. Later he became superintendent of the Norman mine. In 1896 he returned to Colorado and worked for a while as a miner at the Isabel mine. Later he was engaged in a rather extensive prospecting trip in Colorado. In 1897 he went to Ecuador to work with the Twombly interests in the Zaruma mine, later known as the Portovello mine, which has just now reached the end of its production period. Later Finlay was engaged in work for the Cleveland-Cliffs Iron Co. Afterwards he became superintendent of the Standard mines at Mace, Idaho, and in 1902 he was assistant manager of the Bunker Hill & Sullivan mines under Burch. His first real job was as manager of the Portland Gold Mining Co. at Cripple Creek, Colo. It was here that he became convinced of the fallacy of working for a low cost per ton, and, by eliminating the mining of waste, increased the profits of the Portland mine. In 1903 he was in southeast Missouri as assistant superintendent of the Federal Lead Co., a Guggenheim property, which, while comparing favorably with other lead properties of the district, was steadily losing money. Here again Finlay insisted upon clean mining and placed the property on a profitable basis. From 1904 to 1907 he was engaged in consulting work, with offices first in Colorado Springs and later in New York City. His examinations carried him to every state in the union, Canada, the mining regions of South Africa, Australia and other parts of the world. In 1909 he became general manager of the Goldfields Consolidated Mines at Goldfield, Nev.

After his work in Michigan, Mr. Finlay again established a consulting office in New York. He was engaged in many very important examinations, and particularly of the St. Joseph Lead Co. He was later engaged in appraising the mining properties of New Mexico for the State, and did considerable work for the Phelps Dodge Corp. in Arizona. About 1917 he made his headquarters in the West and finally became a resident of Redlands, Calif.

Mr. Finlay was the author of "The Cost of Mining" in 1909 and 1919. For several years he lectured at Harvard and was also the author of many technical articles on mining and geology.

HEATH STEELE

Dr. Francis A. Thomson

Dr. Francis A. Thomson, 71, retired president of the Montana School of Mines and retired director of the Montana Bureau of Mines and Geology, died in Spokane on Jan. 11.

He was born in London, England, in 1879, and in 1886 he came to British Columbia with his parents and made several trips to sea with his father, John Alexander Thomson, who was a prominent seafaring man. Dr. Thomson early chose the mining engineering profession as his life's vocation and, before attending college, gained practical experience in the mining camps of the West. This experience included a short job in Butte as a weighing clerk for the Montana Ore Purchasing Co. in the summer of 1898. He recieved his mining engineering degree with the class of 1904 at the Colorado School of Mines and after that, attended the Royal School of Mines in London and the Ecole des Mines at Paris. He received a degree as Master of Science at the Colorado School of Mines in 1914 and in the summer of 1950, the Colorado institution conferred upon him a medal of honor as a distinguished alumnus. After a few years as dean of the faculty at Washington State College at Pullman, he became dean of the School of Mines at the University of Idaho, at Moscow.

In 1928 he was appointed president of the Montana School of Mines, a position which he held until he retired, because of poor health, on Sept. 15, 1950. During his tenure of president, he also was director of the Montana Bureau of Mines and Geology. Under his direction, both the school and the bureau were built up until they ranked at the top among like institutions in this country and abroad.

Although deeply devoted to his educational and professional tasks, he aptly symbolized the maxim, "If you want a job well done, give it to a busy man," and always managed to find time to perform outstanding civic and humanitarian work for the community in which he lived and in behalf of his friends and neighbors.

In Dr. Thomson's passing the world loses a great man, the educational and mining fields lose an outstanding leader, the commonwealth of Montana loses one of its foremost counselors, and the citizens of this community lose a true friend. He accomplished his life's ambition at a tremendous cost to his health.

CARL TRAUERMAN

Richard C. Goss, district manager for the mining division, Ohio Brass Co., died Dec. 29 in Pittsburgh. He was 52.

Tobias Wolfson, retired president of the Metal Sales Corp., died Jan. 30. He began his career with Lewisohn Brothers in 1889. At his retirement in 1933 he was vice president and director of the International Smelting & Refining Co.

Adam Gordon, consulting mining engineer of Washington, D. C., died Jan. 7. An expert on mining conditions in Central America, he served as vice president and general manager of N. Y. Honduras Rosario Mining Co., San Juancito, Honduras, C.A.

Mark Antony Smith, general superintendent and assistant general manager of El Dorado Limestone Co., died recently. A native of Kentucky, he held various mining positions throughout many parts of the world. From 1927 to 1940 he was employed at Consolidated Coppermines in Kimberly, Nev., where he rose from shift boss to general manager. While there he developed the block caving slushing method on which a patent was issued.

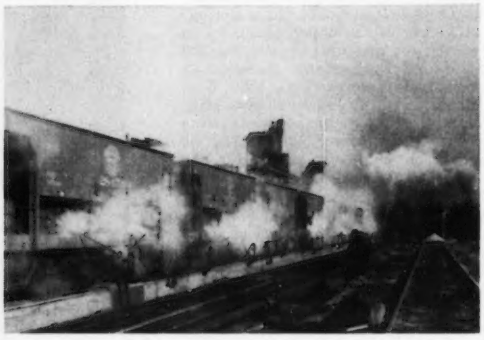
William Arthur Castleton, 68, mining and aviation executive, died Jan. 5 at Seattle, Wash. He worked as a mining engineer in Utah, Montana and Nevada before moving to Seattle in 1918. He later developed the Chichagoff, Sunset and Kougarok mines in Alaska. Mr. Castleton was active in the American Mining Congress and the Northwest Mining Association.

Walter Geist, president of Allis-Chalmers Manufacturing Co., died suddenly Jan. 29. He began as a messenger boy in the blueprint department of the company, worked as draftsman and engineer, and later joined the sales organization. In 1933 he was named general sales representative for the general machinery division and six years later was elected a vice president in that division. He became executive vice president in 1942 and later that year was elected president.

Luther W. Lennox, mining engineer, who began his career in the Cripple Creek district died recently at Baguio, Philippine Islands. Since 1935 he had been superintendent and general manager of Benguet Consolidated Mining Co.

Yellott F. Hardcastle, who retired in 1949 as vice president in charge of manufacturing of Pennsylvania Salt Manufacturing Co., died Feb. 4 in Philadelphia. He was 67.

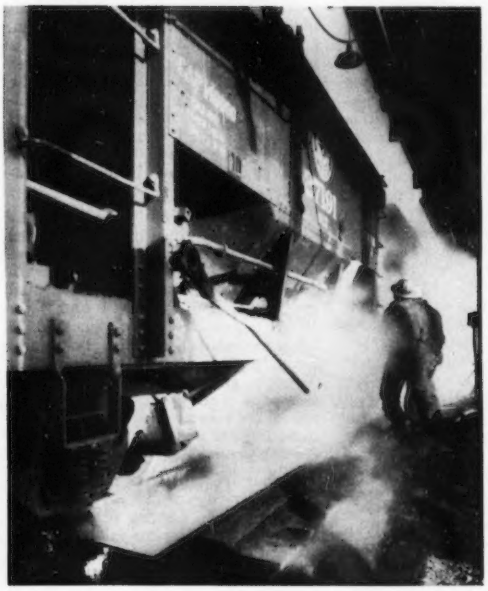
1 STEAM JET is inserted into side of railroad car to thaw frozen iron ore from Mesabi range. U. S. Steel Co. Mills at South Chicago have received 50 carloads of frozen ore. Because mills lack space for unfreezing operations, cars are placed on siding at 101st and the Calumet River for thawing.



2 PIPEFITTER adjusts steam pressure in section of ore cars. Forty cars are warmed up at one time with steam generated by 4 old locomotives leased to U. S. Steel by the Burlington railroad. Two more engines will be added later.

Operation Thaw

U. S. Steel experiments with shipping ore by rail in the Iron Country's sub-zero winter



3 HEATED ORE is unloaded onto conveyor belts. It takes 8 hours to thaw out a car. Although ore was loaded at 20° below zero and Chicago temperatures were below freezing, the thawing process proved to be successful in the first shipment.

4 BARGE takes ore down Calumet River to South Chicago works. Thawing experiment is part of plans to step up production for defense. U. S. Steel plans to move 2 million tons this winter to plants in Chicago, Pittsburgh, and Youngstown districts.

IN MINING

IN THE UNITED STATES

- **CMA Asks Higher Prices** — p. 95
- **Anaconda Seeks RFC Loan** — p. 111
- **Hanna Tests Oregon Nickel** — p. 112

ALASKA

★H. W. Nagley of Anchorage, who holds about 100 claims, reported a strike was made on Falls Creek in the Cache Creek district in 1950. On the basis of one cleanup he feels justified in going ahead with full-scale operations this season. Plans are being made for building a landing field.

★Aluminum Company of America, Reynolds Metals Co., and Aluminum Company of Canada are reported to be considering plants in the Skagway-Haines district. Power from the upper Yukon is estimated to be capable of producing 12 million kw. of electric energy annually. The Alaska Development Board estimates initial investment to establish an aluminum reduction plant in Alaska to be $300 million.

★According to Keith Johnson of the Brinker-Johnson Co., the B-J dredge which has not operated lately was sold to a Nome and Seattle bank. Mr. Johnson said the Nome area and interior face a bleak future unless something is done to encourage gold mining.

★U. S. Tin Co. of Lost River shipped about 100 tons of cassiterite in the last half of 1950. According to Manager F. A. McIntosh, placer operations will continue this season with added exploratory work in a lode property.

★Havenstrite Mining Co. has leased ground on Jump Creek and has constructed a large airport near it. The company employed about 100 last season and plans to continue its operations this year, Jack Allen, manager, reported.

ARIZONA

★A "Kathy Fiscus" bill has been introduced in the State legislature requiring all open excavations, including mine shafts, cesspools, pits, wells and septic tanks to be fenced or covered. Owners of such properties or operators under lease would be responsible.

CALIFORNIA

★Mill Creek Mining Co. is milling about 600 tons of gold ore daily at the Quartz Hill mine on Scott River. Bulldozers and a power shovel are operating.

★U. S. Vanadium Co., a division of Union Carbide & Carbon Corp., has installed a new custom mill for tungsten ore at Pine Creek, near Bishop. An 18x36-in. Traylor jaw crusher will be used for primary crushing of outside ores. Ores containing scheelite or scheelite and powellite will be purchased providing they contain at 0.4% WO_3; a minimum grade of 0.5% WO_3 is preferred.

★Mineral Materials Co., of Alhambra, is shipping about 30 tons of crude ore daily from the newly discovered Starbright tungsten deposit, 25 mi. north of Barstow. The deposit, discovered in the spring of 1950 by A. C. Lambert, has been mined since August, 1950. At present the ore is being mined by open-cut methods, with work being done at night, so that ultra-violet light may be used to check the ore extracted. Plans are being made to core drill the deposit in the near future.

★Idaho-Maryland Mines Corp. is preparing to experiment on reduction of scheelite ore at its Grass Valley properties. A limited quantity of high-grade scheelite was recently opened in a portion of Idaho-Maryland property near the Union Hill mine which produced tungsten in World War II, but which has since been abandoned.

★Sierra County gold mining showed progress during 1950 and promise for 1951. The Monarch near Sierra City and the Alaska at Pike City are producing steadily.

Best Mines is driving a 2,250-ft. tunnel at the Brush Creek and a new tunnel is being extended by the O'Donnell interests at the Kate Hardy in the Forest district.

Yellow Jacket Consolidated Gold Mines Co. is reported to be developing good grade ore at its property near Alleghany. Clifford Hawkins has leased the Morning Glory mine in the same area and is planning development work.

★Central Eureka Mining Co. is seeking to diversify its gold mining operations by possible acquisition of two large copper properties in Arizona and oil and gas leases in Oklahoma. Gold production of the company in December reached a postwar maximum of 4,496 tons milled. Average mill-head value of the ore was a half ounce of gold per ton, or $17.50. Estimated December profit before depletion was $25,000. Donald D. Smith, secretary-treasurer of the firm, said the company does not anticipate the closing down of U. S. gold mines in the event of war.

★Empire-Star Mines and Idaho-Maryland Mines Corp. have signed an 18-month agreement with the Mine Workers Protective League, an independent union, which grants an 11½c hourly wage raise for 300 workers. Paid vacations were included in the agreement for the first time.

★The Strawberry tungsten mine near the southern end of Yosemite National Park, operated by Fresno Mining Co. of Fresno, will go into large-scale operation this spring. A crushing unit has been added to the mill and ore development is progressing with a small crew.

★Johns-Manville's diatomite products plant near Lompoc, Calif., largest of its kind in the world, has launched upon an extensive expansion program, according to officials.

The plant currently has a $1,750,000 annual payroll and employs 550 workers. The expansion will include an enlarged calcining system and warehouses to serve this new unit.

The Lompoc facility mines diatomaceous silica or diatomite which as a finished product is used as filter aids to clarify liquids in the production of sugar, glucose, mineral and vegetable oils, chemicals, etc. Diatomite is likewise used for mineral fillers in such products as auto polishes, paints, varnishes and as high-temperature heat insulation, admixtures in cement mortars, plaster and stucco.

COLORADO

★Metal prices and uranium were among the topics high-lighted at the recent convention of the Colorado Mining Association held in Denver where approximately 1,000 guests participated in meetings covering major subjects vital to the domestic mining industry. The following summary of resolutions adopted reflects the opinions voiced at the meetings:

1. Base prices for copper, lead, zinc, tungsten, and other metals guaranteed for not less than 5 years by the

E&MJ REPORT

Lake Shippers Aim for Record Tonnage in 1951

GREAT LAKES IRON ORE shippers are going to exert every effort this approaching shipping season to move 90 million tons of ore from the upper reaches of the Great Lakes area to lower lake ports. Should that figure be reached it will mark the greatest shipment of iron ore in that region with the exception of the 92 million tons transported in 1942.

Present heavy consumption of iron ore, averaging well over 7 million tons per month, plus an even greater demand when new steel making facilities are placed in operation, make a large movement of ore this year almost mandatory. An estimated six weeks supply of ore will be left in stockpiles by the time the first vessel can possibly make delivery this year, despite all-rail shipping that has been carried out during the winter.

Last year bulk vessels brought to lower lake ports 78.2 million gross tons of iron ore despite a month's delay in getting started in the Spring, due to unfavorable weather conditions, and other factors during the season which slowed up delivery.

Depending on weather conditions, ore shippers hope to have a good part of the 265 ore carrying ships in service by April 1. Government action well before that time is expected to permit Canadian vessels to carry ore between U. S. lake ports from the season's start. Such permission was not granted last year until well after the lake shipping season had opened.

Another factor that may prove of some help this year will be the addition of at least one ship by midshipping season, the converted Victory-type ship, purchased by Cleveland Cliffs Iron Co., now undergoing changes in an Eastern shipyard. Two other ocean-going vessels have also been acquired by Detroit interests and may be used in some capacity to relieve pressure on the bulk carrying fleet.

It will be well into the middle of the shipping season of 1952 however, before the fleet rebuilding program now in full swing with eight shipping companies participating will make itself felt. By then a porton of the 12 new bulk carriers, now on order, will be in service and by mid 1953 practically all of the present orders will have been filled. Even with the delivery of the 12 new ships, most lake shipping companies agree that they will still be far behind a normal replacement progran which would enable owners to dispose of or scrap the smaller, inefficient ships. Here's how present orders are placed.

Company	New Ships Ordered
Pittsburgh Steamship	3
Oglebay Norton	2
Bethlehem Steel	2
Ford Motor Co.	1
Cleveland Cliffs	1*
Interlake Steamship Co.	1
Hutchinson & Co.	1
M. A. Hanna Co.	1

* In addition to victory ship now being converted.

All the new ships, each costing well over $5 million, will have a carrying capacity of at least 18,000 gross tons. The flood of orders for new vessels which landed on the builder's desk, starting in late summer, has completely tied up all ship building ways on the Great Lakes until 1953. In fact a hull of one of the new vessels is being built in one of the ship builder's drydocks.

Colorado *(Continued)*

Federal Government were urged. Prices sufficiently high to pay the producer for development and operating costs plus a fair margin were recommended—also the establishment of stockpile centers where the small miner could sell his ores.

2. The convention called for action to permit closed mines to reopen and thereby decrease our dependency on foreign minerals.

3. Present published metal prices were termed a "mirage" far above those received by mine operators for their production. Such prices it was maintained include not only the price paid to the miner, but also transportation, milling, smelting, and refining costs. As an example, it was pointed out that Prime Western zinc sells for 17.5¢ per lb., but that many miners only receive 2 to 4¢ per lb. for the metal in ore. It was concluded that three-quarters of the metal mines in this country must remain closed unless higher prices are obtained by the mine operator.

4. Higher Federal prices for uranium were requested in addition to deferment of metal miners from military service.

5. The association condemned proposed revisions of the U. S. mining laws, particularly those proposed by the Bureau of Land Management.

6. The U. S. Tariff Commission was asked to make adequate investigation of the difference in production costs of metals and minerals in the United States and foreign countries. It was urged that the effect of foreign currency devaluations be evaluated so that metal tariffs could be adjusted rapidly and periodically to compensate for such devaluations.

7. The price paid for silver by the U. S. Mint should be $1.29, according to convention opinion.

8. The association demanded the remonitization of gold at a price commensurate with its present cost of production and prices of other commodities.

Frank H. MacPherson, manager of AEC's Colorado raw materials office, said that there will soon be a total of eight domestic refineries for uranium, and that many new operators have been attracted to the Colorado Plateau area. Expanded production has required additional milling facilities so that refining could keep up with mining.

The uranium session under the chairmanship of Blair Burwell covered all important details of uranium production.

Officers elected were Blair Burwell, president; and J. Paul Harrison, Harrison Cobb, Charles A. Chase, H. S. Worcester, and E. D. Dickerman, vice presidents.

★U. S. Geological Survey predicts that **13 lead-zinc mines near Climax, Colo.**, will be reopened this spring. A. H. Koschmann, district supervisor of the Survey, said several major mining companies are interested in resuming operations now to meet the demand for strategic metals.

★**Increased activity is noted in Clear Creek County.** The Commonwealth mill and the Silver King mill are getting ready to mill ore. Front Range Mines mill is operating on Mattie ore and also on ore from its Boulder properties. Silver Spruce mill is running on custom ore, as is the Black Eagle mill on Chicago Creek. The flowsheet in the latter is being changed to better handle zinc ore. Maj. E. P. Lupton, operating properties in Georgetown, is negotiating a lease on the Mineral Chief. Its ore runs heavy in lead and zinc. The Griffith, a gold and

(Continued on page 98)

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Colorado *(Continued)*

lead mine, is making intermittent shipments.

★**A tungsten mining boom** will probably hit Boulder County this spring, the U. S. Geological Survey reports. A. H. Koschmann, district supervisor of the Bureau's minerals deposits branch, predicted that three-fourths of the county's 110 mines would be reopened in 1951. Some of the mines have already reopened and others are rushing plans to resume production.

★Creede, famous old Colorado silver camp, is still giving a good account of itself. **Emperius Mining Co.** is operating the Commodore No. 5 adit and milling 4,000 tons of silver-lead-zinc ore in the company differential flotation mill at Creede. A total of 73 men are employed under the direction of E. W. Nelson, general manager, and T. T. Biddle, assistant general manager and mill superintendent. A new 1,000-hp. 950-kw. diesel electric generator is being installed at the mill to replace the one now in use.

★**Climax Molybdenum Co.'s mine and mill** were placed on a full production basis during the latter part of 1950. Men employed increased from 470 early in 1950 to 768 at present. The company recently announced that it had entered into a contract with the Government which would require it to operate its property at Climax at maximum capacity for a period of five years.

★Blair Burwell, president, and Dr. W. G. Haldane, treasurer of Minerals Engineering Co. of Grand Junction, say most of its mining property has been transferred to **Climax Uranium** which is building a new mill at Grand Junction.

IDAHO

★**Lucky Friday Silver-Lead Mining Co.** reports net smelter returns from ore shipments for the first quarter in 1950 as $38,670, second quarter, $85,618, and for the third quarter, $170,791. The company's last shipment to the Golconda custom mill totaled 7,500 tons, which netted 11 carloads of silver-lead concentrates which averaged 160 oz. silver, 60% lead and 2.5% copper per ton, while the zinc concentrates averaged 53% zinc, 10 oz. silver and 9% lead.

★**Silver Summit Mining Co.**, controlled by Hecla and Polaris, is now producing 150 tons of ore per day, concentrates from which will average from 750 to 900 oz. silver and from 18 to 20% copper per ton. The ore is coming from the 3,000, 3,200 and 3,400-ft. levels. As soon as the company pays back development money borrowed from Polaris, it is understood it will proceed from the 3,000-ft. level with development of the Chester Mining Co. claims, in which Hecla owns control, and the Yakima-Shoshone, Silver Chieftain, Mineral Mountain, Silver Dollar and Hayden Hill Consolidated properties, in all of which Polaris has a 50-50 production agreement.

★**Sunshine Mining Co.** is making changes in its mill to handle increased lead in ores coming from the Silver Syndicate property and from the east end of the "Omega" area on the 3,500-ft. and 3,700-ft. levels. The mill has heretofore handled lead largely as a by-product in the recovery of tetrahedrite concentrates.

Sunshine's concentrate output from all sources totaled 252,000 tons in 1950 as compared with 156,000 tons in 1949. The mine is producing from four separate vein systems, three of which were first discovered on and below the 3,100-ft. level.

★Mascot Mines, Inc., recently incorporated to take over the lease of Denver Development Co., operating the **Little Pittsburgh mine**, has started sinking the main shaft to a point 150 ft. below No. 8 level. Since Jan. 1, the company has milled 1,200 tons of ore from the old workings, producing 125 tons of zinc concentrates and 40 tons of lead concentrates.

★Sunset Minerals Co., owners of the **Liberal King mine** on Pine Creek, reports production at a profit of $250,000 for the year 1950. The company is milling 3,000 tons monthly and reports sufficient ore blocked out for three years' operation without further development. O. Bardahl, president of the company, reports:

"In a winze being sunk from the 1,200 to the 1,400-ft. level we have for some time been in exceptionally good ore. It is approximately 6 ft. wide and assays from 22% to 40% combined zinc-lead content with silver values showing an increase."

★**Metropolitan Mining Co.** reports an income of $1,800 from a 16% interest in ore shipped from the Yankee Girl vein during the month of December. Sunshine Mining Co. owns the other 84%. Sunshine is driving a long prospect crosscut south through Metropolitan ground towards the Big Creek fault. This crosscut is on the 3,100-ft. level and has now been advanced 2,962 ft. to within an estimated 700 or 800 ft. of the fault.

★Diamond drilling from the 700-ft. level in the **Highland-Surprise mine** on Pine Creek has revealed the existence of two new veins in the adjoining Nevada-Stewart property, according to Robert D. O'Brien, manager of Highland-Surprise. One vein is 11 ft. wide and the other 15 ft. wide, both showing low-grade zinc-lead mineralization at the point of intersection.

★**Spokane-Idaho Mining Co.** is sinking from the 1,400 to the 1,800-ft. level and had already completed the shaft to the 1,600-ft. level.

★**Sidney Mining Co.** on Pine Creek reports gross production 85,721 tons of ore valued at $1,760,241. The average metal content was 7.76% zinc, 4.28% lead and 1.7 oz. silver per ton. The company has now completed its 3-compartment shaft to 260 ft. below the No. 9, or Red Cloud tunnel level and will crosscut on the 200 and 400-ft. levels below the collar.

IRON COUNTRY

★St. Louis County commissioners have indorsed a proposal to permit the **Reserve Mining Co.** to use the water of Birch Lake for their new $7-million taconite plant at Babbitt. The plant is expected to produce 300,000 tons of concentrates per year. The water used in the plant is to be returned to the lake after the tailings have settled out.

★Oliver Iron Mining Co.'s **experimental shipment** of 135 cars of ore to eastern furnaces was sufficiently successful so that all-rail shipments have been continued throughout the winter. The company states that this is the first full-scale, all winter ore movement in the Lake Superior district's history. It was expected that shipments may reach as much as 400 cars per day. The ore is treated with calcium chloride as it is loaded at the mines and the steel plants have installed steaming facilities similar to those used at Duluth and Superior ore docks during freezing weather of the late fall. The ore has been coming from the Spruce and Godfrey underground mines and the Canton, Sherman and Mountain Iron pits.

★**Republic Steel's Susquehanna mine** at Hibbing has been doing winter stripping which will enlarge the pit for the 1951 season.

★**Steep Rock Iron Mines, Ltd.**, shipped 1,216,614 tons of ore in 1950, establishing a new record for the mine. Shipments in 1949 totaled 1,134,261 tons. Steep Rock is developing an underground mine which is expected to begin production in late 1952. It is also stripping at its Errington pit and carrying on hydraulic dredging at its "A" orebody. The Errington's plan was to move 1½ million cu. yd. of stripping between the close of the 1950 ore season and May 1.

★**Inter-State Iron Co.** shipped a total of 3,510,053 tons of ore from its Minnesota mines in 1950. For the first time, the Hill-Annex mine at Calumet dropped from first place in the company's list. It shipped 751,682 tons and was exceeded by the Longyear with 984,586 tons and the Columbia with 789,676 tons. The Grant forwarded 363,183 tons and 336,015 tons, mined and shipped by M. A. Hanna Co., came from the South Longyear. All the company's mines have a full program for the winter months.

★Pickands, Mather & Co. is **stripping at eight of its Mesabi range mines:**

(Continued on page 100)

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Iron Country *(Continued)*

the Mahoning and Albany at Hibbing; the Danube-Orwell at Bovey; the Bennett at Keewatin; the Carmi-Carson at Carson Lake; the Wade at Kinney; the Biwabik and Embarrass at Biwabik. The company is also doing stripping work at the Mahnomen and Sagamore properties on the Cuyuna range.

★Stripping at **Oliver Iron Mining Co.'s new King mine** at Coleraine will be actively pushed during the winter. Other Oliver stripping operations will include the Auburn, at Virginia; the Kosmerl, at Buhl (a new mine) and the Knox and Burns, at Aurora.

★**M. A. Hanna Co.'s Minnesota mines** shipped a total of 10,043,926 tons in 1950 with the Mesabi range contributing 8,104,728 tons; the Cuyuna, 1,617,527 tons and the Spring Valley mine (southern Minnesota) 321,671 tons—all rail. The largest shipper was the South Agnew, 817,349 tons: a notable accomplishment, considering its brief existence as a difficult open-pit mine. It was followed by the Bray, 742,493 tons and the Buckeye, 681,740 tons.

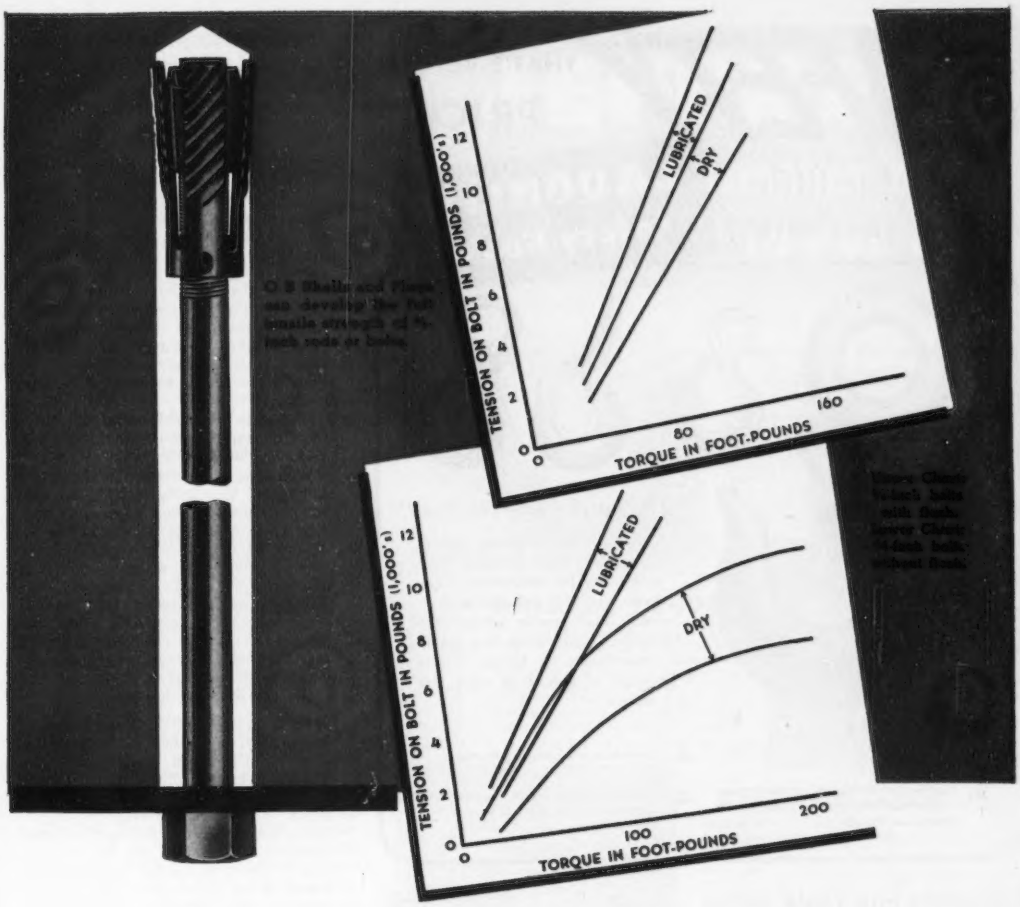
★Oglebay, Norton & Co. expects to start production from the St. James property, Aurora Village, on the eastern Mesabi, by the latter part of 1951. It will manage the property for the owners, namely Bethlehem Steel Co., which hold 75%, and Armco Steel Corp., which has the balance. The last shipment was made in 1924. There still remains well over 3.5 million tons. The St. James will be operated as an open pit. Oglebay, Norton has already constructed a large building in which offices, shops and truck repair facilities will be housed. Another building, 50 x 260 ft. is to be erected for truck storage.

This will give Oglebay, Norton & Co. two operating properties this year, including the Montreal mine, in Wisconsin, in addition to the operations of Reserve Mining. Orders are being placed now for the equipment for Reserve at Babbitt. The necessary machinery for this taconite enterprise is hard to secure.

Oglebay, Norton's Eureka mine at Ramsay, Mich., on the Gogebic Range, finally petered out last year after mining had reached well below the 3,500-ft. level. The shaft of the Eureka is now being used by Pickands, Mather for an adjoining property which it operates.

Oglebay, Norton will also eventually develop and operate the two 40-acre tracts adjoining the St. James for the Oliver Iron Mining Co. which owns the fee.

★W. S. Moore Co. will begin soon to open up its **Jordan Reserve mine**, at Buhl. The mine has an estimated tonnage of 256,823 tons. No shipments have yet been made from the mine.



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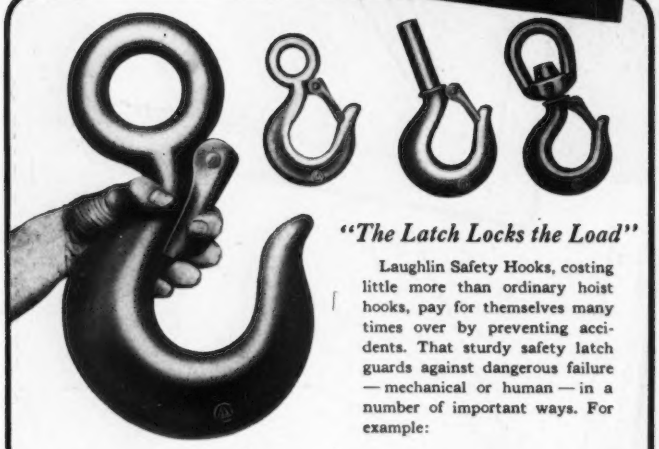

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Iron Country *(Continued)*

★Figures compiled in the offices of the Lake Superior Iron Ore Association reveal that the tonnage of iron ore on docks or in mill yards as of Feb. 1, 1951, totaled 30.2 million tons while consumption of ore during January totaled 7.3 million tons. The figures clearly indicate that considerably less than 10 million tons will be at mills and docks down the lakes on May 1, since ordinarily the amount of ore received in April is of little consequence.

Ice in the Lake Superior area in the latter part of February showed a variation in thickness from 28 in. to as much as 42 in. Strangely enough, this was 6 to 8 in. less than a year ago, despite the severe weather of the past winter.

The date when shipments by water start depends more on weather conditions during the first two weeks in March than upon the ice conditions in February. One thing is sure, the vessels will start moving as soon as passage can be made through the St. Mary's River and Whitefish Bay, the two troublesome spots, ordinarily. However, the boats tied up in Lake Michigan will probably start before those moored in Lake Erie ports this year, inasmuch as they can start on an Escanaba-Chicago schedule, regardless of conditions at the Soo or in Duluth-Superior harbor.

★At a meeting of the **Lake Superior Mines Safety Council** in Virginia on Jan. 11, Dr. E. N. Peterson of the Lenont-Peterson Clinic, gave a talk on "The Purpose of the Medical Program in the Iron Mining Industry". Other talks were: "Safety in Beneficiation Plants" by S. F. Willey, general foreman at the Mt. Iron washing plant of the Oliver Iron Mining Co.; "Safety in Handling Heavy-Duty Truck Tires", by Col. T. A. Oberlander of Hibbing, and "Civilian Defense", by Col. A. B. Miller of St. Paul, Minn., Civilian Defense Director.

★Zontelli Brothers of Ironton, Minn., have begun work on the **Gorman property in Morrison County, Minn.**, near Randall, a new area for mining. Randall is about 25 mi. southwest of Brainerd. It is expected that ore may be shipped from the property in 1951.

★Inter-State Iron Co. is stripping at its **Schley mine**, Gilbert, and expects to ship ore from the pit in 1951. The Schley is an old underground mine which was opened up by the Republic Steel Corp. more than 40 years ago. Inter-State is also stripping at the Longyear mine at Hibbing and Hill-Annex at Calumet. In addition, the Hill-Annex is building two new pockets and screening plants. The product of one of these plants will be carried to the main pit pocket by cross conveyor.

★M. A. Hanna Co.'s **Perry mine** is building a new screening plant and

a new service garage. Stripping is being carried on at the Argonne, Harrison and Halobe mines in the Nashwauk area. The Morton mine, west of Hibbing, moved nearly 400,000 cu. yd. of surface in December and will continue through the winter with two 6½-cu. yd. shovels. The Section 6 mine on the Cuyuna range and the Buckeye on the western Mesabi range are also doing winter stripping. Other Hanna mines are carrying on stripping plans or are busy with regular winter repair programs.

★**Pickands, Mather & Co.**, acting for a group of steel companies and iron ore producers, is negotiating with Steep Rock Iron Mines, Ltd., to option more than 1,000 acres of iron ore property in the Steep Rock Lake area of western Ontario. Plans are being made to explore the property which is near that under option to the Inland Steel Co.

★**The twelfth annual mining symposium** was held in Duluth on Jan. 16 and 17. It was attended by mining men from all the Lake Superior iron ranges and by many from other districts. Papers were given on "Available Water Supply in Northern Minnesota for the Iron Mining Industry" by Chester S. Wilson, George M. Schwartz and Paul Speer; and on "Drilling and Blasting of Hard Rock in Large-Scale Iron Mining on the Eastern Mesabi Range" by Richard M. Belliveau, Nashwauk, general superintendent of Mesabi range mines for the Cleveland-Cliffs Iron Co. on the 16th. The 17th, with Louis J. Erck of Ishpeming, Mich., chief metallurgist for Cleveland-Cliffs, presiding was devoted to the history and development of the pelletizing process. W. W. Wade, Minneapolis, assistant director of the University of Minnesota Mines Experiment Station, gave a paper on this currently interesting subject.

★**Cleveland-Cliffs Iron Co.** shipped a total of 7,882,919 tons in 1950. Of this amount, 3,891,887 tons came from the Marquette range of Michigan with the Mather mine its leading shipper at 1,308,584 tons; the Spies-Virgil on the Menominee range produced 257,838 tons and the Mesabi range furnished 3,733,194 tons of which the Holman-Cliffs at Taconite contributed the largest tonnage, 872,666 tons, while the Canisteo at Coleraine was second with 678,922 tons. There were eight shipping properties from the Marquette range, one from the Menominee and nine from the Mesabi range.

★**Cleveland-Cliffs' Mather "A" mine** produced 1,251,963 tons during 1950, establishing a new record. This is said to be a world record for any single shaft iron ore mine. In addition to this tonnage, the Mather "B" mine, just coming into production, produced 48,118 tons in 1950, making a total for the two shafts of 1,300,081 tons.

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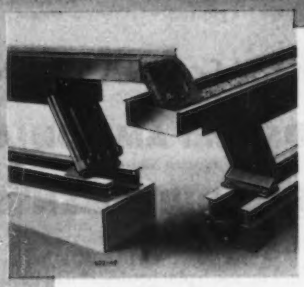

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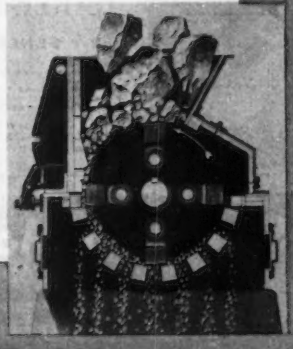

Miracle Hammer
CRUSHER
(Patented)

Here is a heavy duty type crusher designed for the reduction of large pieces of material in a single operation. Thus it can do the same work ordinarily done by two or more other types of crushers.

Catalog 827 gives complete details on various types of Jeffrey Crushers. Write for your copy today.

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Year in, year out Baker & Adamson "C.P." Acids and Ammonia always meet or surpass the strict purity standards set by the chemical profession itself—*through the American Chemical Society*—governing reagents suitable for careful analytical work. Every *ton* —every *pound*—is "quality controlled" at each step on its way to you.

These purity products are packaged in 1 lb. and 5 pint bottles, and in B&A special 6½ gallon carboy—the completely-covered container with screw-cap closure which is ideally suited for process use.

Production facilities for B&A Reagent Acids and Ammonia are strategically located across the nation; and ready-for-delivery stocks are carried by B&A's huge chain of distributing stations in industrial centers from coast to coast. Any one of the offices listed below will handle your order promptly and efficiently.

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Iron Country *(Continued)*

★M. A. Hanna mines of the **Iron River district,** which produced nearly two million tons of ore during 1950, are actively stockpiling ore in preparation for the season of 1951. Dewatering continues at the Tully mine; and the Richmond pit at Palmer is busy with winter repair work.

★Pickands, Mather & Co. is sinking a new shaft at its **Ironton mine** at Bessemer. The shaft is down to ledge.

★The **Tobin mine of Republic Steel Corp. at Crystal Falls,** has gone on a six-day-per-week schedule instead of the previous five days. Negotiations are pending with M. A. Hanna Co. to permit the Tobin to mine ore from Hanna's Monongahela mine which adjoins the Tobin on the west. The Monongahela was operated by the Hanna Co. about 25 years ago, work then being confined to two levels. Although no actual mining had begun at the Monongahela as of Feb. 1, hoisting engineers began work at the mine in January.

★A new iron ore mine will be opened by **Inland Steel Co.** near Crystal Falls, Mich., according to an announcement by P. D. Block, Jr., vice president in charge of raw materials. Development work at the mine, which will be named for A. J. Cayia, Inland's manager of ore mines and quarries, will start immediately. It is expected that the property will be in production late in 1952, and that it will produce 200,000 tons annually. The lease on the property was acquired from Jones & Laughlin Steel Corp.

MICHIGAN

★M. A. Hanna Co. shipped a total of 2,071,540 tons from its **five Michigan mines** in 1950. The Richmond, on the Marquette range, sent 224,168 tons and the Bengal-Tully, Hiawatha, Homer and Wauseca, on the Menominee range, shipped 1,847,372 tons. The company was the Menominee's largest shipper with 1,847,372 tons or 44.83% of the range total of 4,120,414 tons.

★At the request of James Boyd, deputy administrator of the U. S. Bureau of Mines, **Copper Range Mining Co.** has submitted a preliminary development plan for reopening its White Pine copper mine near Bergland. The plan proposes building a mill with an initial capacity of 10,500 tons of ore per day and a metallurgical plant. President Morris La Croix says that 85% of the copper can be recovered. The ore averages better than 22 lb. of copper per ton. It is believed the property can ultimately produce 75 million lb. of copper per year. Although the mine is 70 years old, it has never been fully developed. Because of the low grade of its ore, it could not be operated profitably. Many other mines in the area have

also been abandoned in past years. It is stated that the Copper Range Co. has been assured approval of the Defense Minerals Administration for a loan of $100 million for the development of the White Pine property.

★Three projects for the unwatering and reopening of mines in the **Michigan copper district** have been submitted to Defense Minerals Administration in Washington by Calumet & Hecla Consolidated Copper Co. Engineers of the company have been working on the detail of these projects for more than two years. It is conservatively estimated that they will make available more than three-quarters of a billion lb. of copper, which can be produced at a rate of between 60 and 70 million lb. per year.

Formal applications were filed early in January, including geological reports, engineering reports, and detailed plans for financing. Estimates of equipment costs, operating costs, and labor requirements were also included.

Regulations call for financing of projects such as these by loans from private sources, guaranteed by the Government, or by direct Government loans. These are coupled with procurement contracts with the General Services Administration setting a price floor below which the Government will protect the company by direct purchases.

MONTANA

★A custom flotation mill has been built at Basin, Jefferson County, to concentrate the ores of the district which contain gold, silver, lead, copper and zinc. According to advices from Tacoma, Wash., the mill is owned by the **Metals Mining Co., Inc.** John MacGinniss, of Los Angeles, is in charge of construction and operation.

★**Sunlight Mining Co.** has applied to the Government for a lease on 600 acres of phosphate land, adjoining the company's 49 claims on Princeton Creek, Granite County. The company, of which Fred G. Fulton, Spokane, is president, is successor to the Moonlight Mining Co.

★At the ninth biennial legislative meeting and banquet of the **Mining Association of Montana** and its Helena chapter, the Last Chance Gulch Mining Association, held in Helena on Jan. 11, the business session was addressed by Col. E. K. Cheadle, Helena, acting director of the Civil Defense Movement in Montana, and Sheldon Wimpfen, a member of the Raw Materials Division of the AEC, Washington, D. C. Col. Cheadle spoke on the various phases of defending the people and industries of the state in the event of an attack, and especially dwelt on the protection of the various mining districts. Mr. Wimpfen gave a review

(*Continued on page 111*)

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KEEPS 'EM TIGHT

The COMPLETE Victaulic System is the EASIEST WAY TO MAKE ENDS MEET! Victaulic offers a complete line of Full-Flow Elbows, Tees and other fittings, all carefully designed for free-flowing efficiency and leak-tight dependability.

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SAVE time, work, and dollars on your piping construction and maintenance. JOIN UP with Victaulic.

Make your next piping job ALL VICTAULIC. Write today for Victaulic Catalog and Engineering Manual No. 44-8A.

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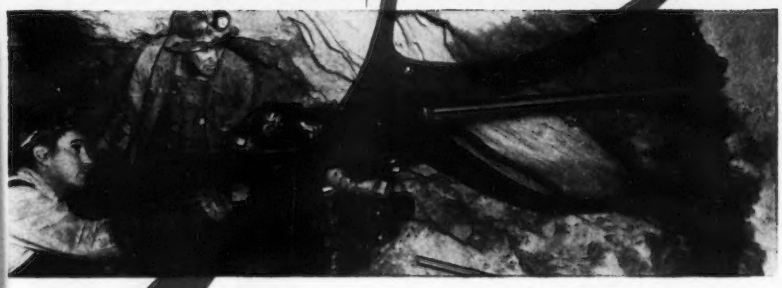
DRILLING OUT HARD ROCK

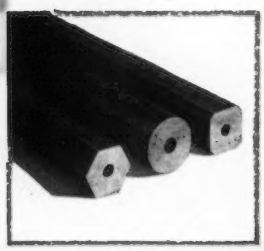
ANOTHER JOB for HOLLOW DRILL STEEL



When you're up against a tough, hard-rock drilling operation, set up your drills with Crucible Hollow Drill Steel. This quality steel is built to take the punishment of around-the-clock operation of modern, high air-pressure rock drills. And you have the assurance of minimum breakage . . . and an end to loss of expensive bits.

That's because *every* lot of Crucible Hollow Drill Steel is *pre-tested* before it gets to you. What's more, Crucible Hollow Drill Steel is backed by the experience of engineers and metallurgists who are drill steel specialists. They work right on the job with you . . . if you need them.

You get all these extras when you do business with Crucible. Our metallurgists and drill steel experts can help you with these "special" jobs that take something different in drill steels. CRUCIBLE STEEL COMPANY OF AMERICA, General Sales and Operating Offices, Oliver Building, Pittsburgh, Pennsylvania.



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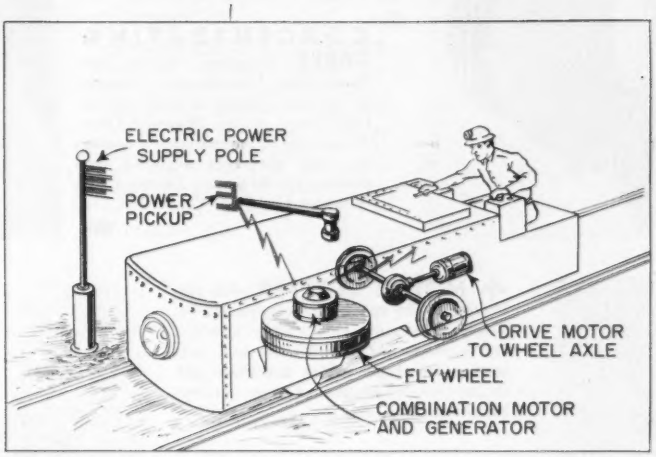
PREVIEW

Will Mine Locomotives Soon Be Powered by Flywheels?



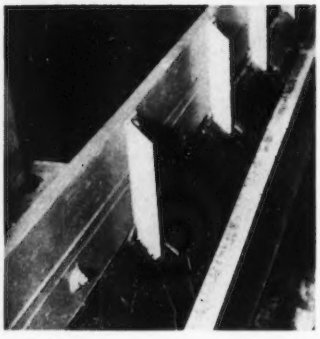
BEFORE LONG YOU MAY BE able to buy a mine locomotive that is powered by the energy stored in a massive flywheeel. Ateliers de Construction Oerlikon, a European company, is now testing a bus in Zurich that operates on just that principle. Here's how it works.

An electric motor, driven by an outside source of current brings the huge flywheel up to speed (3,000 r.p.m.). The power pick-up of the bus then breaks contact with the power supply pole. Now the electric motor becomes a generator, powered by the spinning flywheel. The generator supplies electricity to another motor to run the bus.

The bus will run 4 to 6 miles on energy stored by the flywheel. Charging takes 15 to 60 seconds. In a mine, power-supply poles could be placed along the haulage ways at convenient intervals to provide sources of electricity. The system eliminates the problem of fume control, and requires no trolley wires.

POWER SAW uses 21-in. long twin reciprocating blades at 1,500 strokes per minute, with no limit to the depth of cut. Blades can be changed in seconds and resharpened. Weighs 14 lb., operates from any 60-cu. ft. compressor. Wright Power Saw & Tool Corp. (2)

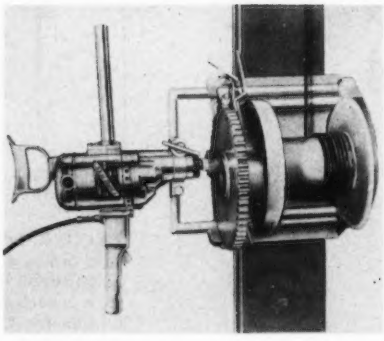
BOTTOM DUMP SKIP insures complete dumping with parallel sides and no reduction of inside cross section. Door design like shovel dipper, is quick dumping and has watertight positive metal-to-rubber seal. Lake Shore Engineering Co., Michigan. (3)

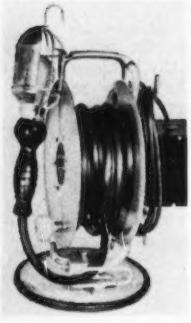


CONCENTRATING TABLE increases capacity for discharging high-gravity fraction of feed by venting several feet of back board of the Diagonal Deck Table so as to approximately double the deck periphery available for concentrate discharge. Deister Concentrator Co., Fort Wayne, Ind. (4)

MOTOR STARTER with ratings up to 600 v., 7½ hp. polyphase, 5 hp. single phase, or 220 v., 1½ hp. d.c., starts, stops and provides overload protection for single phase, polyphase and d.c. motors. Westinghouse Electric Corp., Pittsburgh, Pa. (5)

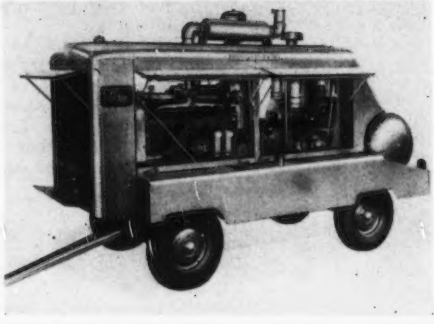
COMBINATION DRILL-HOIST offers you a 1-in. Skil drill for maintenance and installation work plus a hoisting capacity of 1,000 lb. at 10 fpm. Simple adapted kit locks drill and an American Handiwinch in perfect alignment. Skilsaw, Inc., Chicago, Ill. (6)



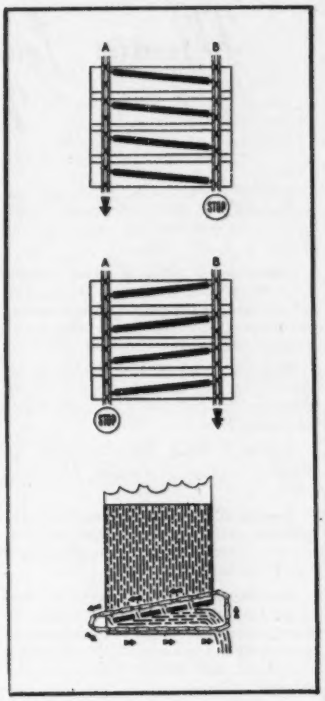


PORTABLE LIGHT is designed for worker's convenience at greater distances from electrical source. Reel-Lite is available with extension cords of 50 and 100 ft. Etraco Mfg. Co., Flemington, N. J. (7)

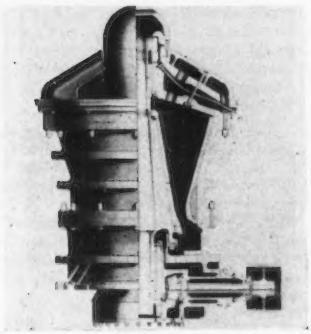
PORTABLE COMPRESSOR, rotary type, delivers 600 cfm. free air at 100 psi. Total weight, 9,500 lb. Discharge temperature reported as 100° below conventional type. Ingersoll-Rand Co., Phillipsburg, N. J. (8)



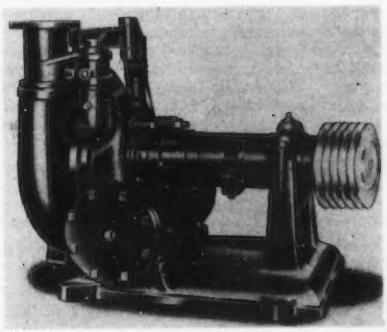
TRANSMISSION BELT, made of rubber and fabric with teeth, fulfills need for power drive which will not slip and permits precision timing. It will attain speeds up to 16,000 fpm. and operate more quietly than precision gears in oil bath. U. S. Rubber Co. (9)



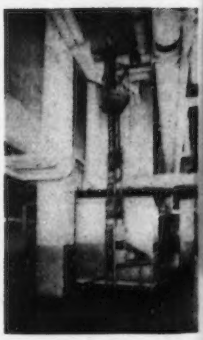
"BULKBIN" DISCHARGER may be answer to problem of discharging fine ore bins. (1) Bottom of bin is sloped and has several transverse lots. Continuous chains A and B connected by steel bars, are pulled alternately through the bin. (2) While A moves, B is stopped and vice versa. Bars move across bin bottom; material falls through slots. (3) Chains, passing into bin again, help discharge material from slots. Bulkin Co., England. (10)



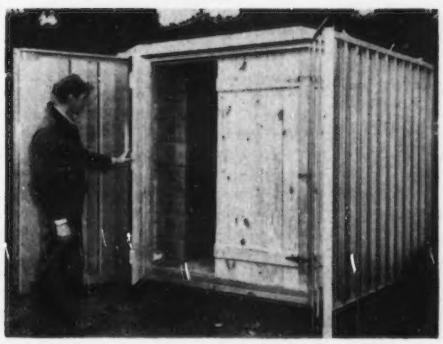
GYRATORY CRUSHER with cast steel shells and straight down discharge comes in 11 different sizes. Cast steel spider hub permits main shaft to be raised as wear progresses so that no more than one resetting of concaves is needed during life of crushing surfaces. Allis-Chalmers Mfg. Co., Milwaukee, Wis. (11)



SAND PUMP Model K, features 2-piece frame construction which permits rubber-lined or special-alloy intake chamber to be replaced readily and easy removal of wear parts. Has any type connection and 1 to 8-in. discharge. A. R. Wilfley & Sons, Inc., Denver, Colo. (12)



EXTENSION SCAFFOLD is electrically operated, can reach a height of 26 ft., and maneuvers easily. Atlas Industrial Corp., Brooklyn, N. Y. (13)



DYNAMITE STORAGE near blasting site, with protection against pilferage is provided by 275-cu. ft. box with 6-ton capacity. Dravo Corp., Pittsburgh, Pa. (14)

BIN VALVE, tradenamed "Twistite," has 2 rubber sleeves joined by rotating steel collar. Tight closure obtained by pulling on cable. Valve is self opening. Standard 6-in. valve weighs 35 lb., handles 2½-in. lumps. Other sizes available. Stephens-Adamson Mfg. Co., Aurora, Ill. (15)

Memos from the Manufacturers

Gardner-Denver Co.: C. H. Rieman appointed manager of mining division to fill position left vacant by the death of A. W. Dale.

Connellsville Mfg. & Mine Supply Co.: Election of Frederick H. Lindsey as executive vice president announced recently. He is to be in charge of production, engineering and sales.

Simplex Wire & Cable Co.: J. N. Macalister has retired as manager of Chicago district office. W. H. Davis succeeds him.

National Lead Co.: Kenneth C. Specht named manager of trade sales.

Joseph T. Ryerson & Son, Inc.: Appointed exclusive warehouse distributor for Rockrite tubing, manufactured by Tube Reducing Corp.

Birdsboro Steel Foundry & Machine Co.: New officers are Robert F. Rentschler, vice president assigned to special duties; James M. Heppenstall, treasurer, and Lester Leinbach, secretary.

Allis-Chalmers: John F. Costigan named assistant works manager of Norwood (Ohio) Works; John P. McLaney, Webster C. English and Andrew J. Beall, Jr., named to general machinery division offices in the South.

Link-Belt Co.: District manager A. K. Kolar (Moline, Ill.) appointed assistant sales manager for Pershing Road plant products, with office in Chicago; S. T. Penick, district engineer at Dallas, Tex., transferred to Moline as district manager.

American Cyanamid Co.: Richard L. Newman, formerly associated with Pabco Products, Inc., has joined the Technical Field Service Div., Pigment Dept., Calco Chemical Div., Bound Brook, N. J.; R. N. Griswold named mid-Central regional sales manager, Pigment Dept., Calco Chemical Div.

Mine Safety Appliances Co.: New sales and service representative in Bolivia, Chile and Peru for International Div. is Arnold Payette. His headquarters will be in Lima, Peru.

Worthington Pump & Machinery Corp.: Robert T. Haslam elected to the board of directors; W. A. Finn named general European manager to replace A. W. Fraser, who is assuming an executive sales position with headquarters in Chicago.

Borg-Warner Corp.: Arthur Peacock named assistant secretary-treasurer and controller of Borg-Warner International Corp., Chicago; Thur Schmidt appointed assistant to the president, Ingersoll Products Div.; Harold G. Ingersoll elected a vice president; L. G. Porter elected treasurer; Dr. Maurice Nelles appointed director of engineering development section.

American Air Filter Co., Inc.: New manager of dust control div. is John M. Kane.

Crucible Steel Company of America: Appointment of R. K. Warren as assistant manager of Tool Steel Sales announced; Robert C. Kuhn appointed assistant district manager of Cleveland Sales office; Ira G. Sutton new general superintendent of Sanderson-Halcomb Works, Syracuse.

Rem-Cru Titanium, Inc.: George T. Fraser appointed manager of sales, with temporary headquarters at Bridgeport, Conn.

Hardinge Co., Inc.: Robert J. Russell, formerly chief of technical staff, appointed sales manager.

Kennametal, Inc.: John C. Redmond, formerly research director, elected vice president in charge of metallurgical development. He will direct an expansion program involving the expenditure of a half-million dollars. Newly-elected officers are Alex G. McKenna, executive vice president; Richard J. Flickinger, assistant secretary; Bennett Burgoon, Jr., appointed assistant to general sales manager.

Jeffrey Manufacturing Co.: Appointment of Russell W. Knode as manager of the Export Dept. announced; L. E. Bixby promoted to manager of Contract Dept.

The Trumbull Electric Mfg. Co.: J. J. Pascher named district sales manager of New York district; Charles Bangert, Jr., appointed manager of engineering and will be in charge of all engineering activities.

Nordberg Manufacturing Co.: Francis W. Cross newly-appointed sales engineer, Heavy Machinery Div.

National Safety Council: Charles F. Alexander named manager of the Industrial Dept.

Kenilworth Steel Co.: Appointment of Joseph G. Wortley as manager of sales announced.

Bucyrus-Erie Co.: Southwest Machinery Co., Oklahoma City, Okla., appointed as distributor for general purpose excavators and Hydrocranes.

Atlas Steels, Ltd.: Gilbert Soler has resigned as vice president, manufacturing operations and director.

Westinghouse Electric Corp.: W. P. L'Hommedieu appointed assistant Pacific Coast district manager, with headquarters in San Francisco; H. C. Coleman named manager of industry engineering departments; W. G. Miller appointed manager of manufacturing for Motor and Control Div., Buffalo.

General Electric Co.: Elliott Harrington appointed vice chairman and secretary of newly-established Defense Projects & Priorities Committee of Small & Medium Motor Divisions; Francis J. Boucher appointed manager of manufacturing of Small & Medium Motor Divisions; David C. Prince, vice president, named to President Ralph J. Cordiner's staff, with special duties as assigned; Robert L. Gibson named general manager of Chemical Dept. with headquarters in Pittsfield, Mass.

Alloy Rods Co.: C. R. Carlin elected vice president in charge of production and R. K. Lee vice president in charge of research and engineering, two newly-created positions; E. J. Brady elected president and chairman of the board, M. G. Sedam, executive vice president, W. D. Himes, treasurer, and H. L. Weaver, secretary and assistant treasurer.

U. S. Steel Corp.: David A. Challis, Jr., appointed assistant general manager of sales; Acme Steel Co. licensed to manufacture "Cor-Ten", developed by Carnegie-Illinois Steel Corp.; appointments of John H. Elliott as general manager, manufacturing, and William C. Oberg as manufacturing consultant, have been announced; Robert C. Tyson, comptroller, elected a vice president.

Kaiser Steel Corp.: N. H. Balaam transferred from northern California to Washington, D. C., to manage company's recently-opened offices there.

The Lincoln Electric Co.: W. R. Persons elected vice president in charge of sales.

Babcock & Wilcox Tube Co.: Alan W. Abegglen appointed to the sales force of the Beaver Falls, Pa., district sales office; David W. Jones, Jr., of Denver, Colo., named sales agent in the Rocky Mountain area.

Marion Power Shovel Co.: Appointment of John C. Priest as sales representative in the Chicago district office announced recently.

Pyrene Manufacturing Co.: Wallace B. Phillips elected president to succeed Edward J. Waring, who retired August, 1950, after serving the company almost 40 years as treasurer, vice president and president.

Atlas Steels, Ltd.: H. George De Young, formerly assistant to the president of Treadwell Engineering Co., appointed works manager.

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

PUMP SELECTION. Economical pumping units for every job are cataloged in a 16-page "Handy Guide to Selection of Centrifugal Pumps" released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. A wide variety of units are indexed and head capacity charts and tables are given along with data on sizes, capacities and construction features. (75)

CAR SHAKER. Construction features with specifications and a cross section through the vibrating mechanism are given in bulletin 07B7221A on the carshaker for unloading granular material from hopper-bottom gondola cars. Allis-Chalmers Mfg. Co., Milwaukee, Wis. (76)

LIGHT-WEIGHT PIPE. Applications of Naylor Locseam Spiralweld pipe plus tables of data on fittings, flanges, connections and pipe specifications from 4 to 30 in. in diameter are packed into a 4-page folder issued by Naylor Pipe Co., Chicago, Ill. (77)

BATTERIES. "Ironclad Batteries for Motive Power Service," a catalog describing the performance and utility of storage batteries for users of materials handling and haulage vehicles, has been announced by Electric Storage Battery Co., Philadelphia, Pa. (78)

MOBILE CRANE. In 24 pages and 74 illustrations you get acquainted with machine design and job applications of the CraneMobile, available in 20 and 25-ton capacities. Bay City Shovels, Inc., Bay City, Mich. (79)

DRILL STEEL. The data sheet which tells you all about CA Double Diamond alloy hollow drill steel and its use with detachable bits, contains an excellent temperature chart indicating the change in temperature of hot steel as the color changes from faint red to white in going from 900° F. to 2,200° F. Crucible Steel Company of America, New York, N. Y. (80)

APPRENTICESHIP. Ten ways in which apprenticeship pays worthwhile returns are outlined in this pocket-size pamphlet, "Apprenticeship Pays Dividends" (3 min. reading time). Listed in the pamphlet are other publications on the subject which also may be obtained from the Bureau of Apprenticeship, U. S. Department of Labor. (81)

DRAGLINE. Introducing the Manitowoc Model 3900 long-reach crane and dragline, rated as a 3-yd. dragline, with lift capacities of 60 tons at 12-ft. radius and 30 tons at 30-ft. radius. Lots of details in this illustrated 12-pager put out by Manitowoc Engineering Works, Manitowoc, Wis. (82)

PACKAGED GENERATORS. The inside story on the "Why" and "How" of the economical E-M Packaged generators (3.75 to 187 kva.) is given in a 16-page booklet, "The ABC of 'Packaged' Generators." You'll find much helpful electrical information plus charts, graphs and illustrations to aid in the selection and application of packaged generators. Electric Machinery Mfg. Co., Minneapolis, Minn. (83)

CRUSHING. Three bulletins from Pennsylvania Crusher Co., Philadelphia, Pa., give you information on both theory and practice for 3 units: No. 2011 on single roll crushers; No. 6016 on reversible inpactors; and No. 9001 on the ring type granulator. (84)

LABORATORY EQUIPMENT. Catalog 450 is an all-inclusive, up-to-date reference work on all kinds of laboratory apparatus and supplies. It lists over 25,000 items and includes many improved methods and aids for chemical analysis and testing. Burrell Corp., Pittsburgh, Pa. (85)

SHUTTLE CARS. Folder illustrates and describes the distinctive features of the cable reel shuttle cars made by Goodman Mfg. Co., Chicago, Ill. (86)

MICROFILMING. "Facts and Figures on Microfilming Engineering Drawings" present pertinent information for the executive responsible for the safekeeping of important company records. It discusses the importance of microfilming, costs, equipment, film storage and related subjects for those who entertain worries about things to come. Micro-Photo Service Bureau, Cleveland, Ohio. (87)

SHAFT SEALS. Where leakless operation of a rotary shaft on a pump or other equipment is required, a good mechanical seal will do the job. Garlock Packing Co., Palmyra, N. Y., offers you a well illustrated booklet showing how its seals function and contains information on their application, installation and construction. (88)

DRAINAGE STRUCTURES. To assist construction engineers, superintendents and foremen in proper methods of installing Armco drainage structures, culverts, sewers or conduits, Armco Drainage & Metal Products, Inc., Middletown, Ohio, has published a 46-page pocket-size manual instructions on proper excavation, assembly of pipe and backfilling are explained and illustrated. (89)

LOCKNUTS. "Type of Locknuts and Their Principles of Operation" gives you some handy hints to help you in your war against vibration. It's published by Industrial Fasteners Institute, Cleveland, Ohio. (90)

TRANSMISSION BELTING. Form No. 3678 carries formulas, charts and tables for the proper selection of transmission belting which will prove helpful to designers. Thermoid Co., Trenton, N. J. (91)

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RUBBER RECONDITIONER. "Rub-R-Vive", when applied by cloth or brush to an old rubber surface, actually plasticizes the rubber and is said to impart the feel, grip and resilience and performance of new rubber. Schwartz Chemical Co., New York, N. Y. (35)

METAL SEPARATOR. Unit extracts food metal from skimmings, slags, dross, and sweepings remaining in the production of hot-dip galvanizers, die casting works, foundries, smelting plants and others engaged in melting and casting of non-ferrous-metals. Operating features are: no heat, no water, automatic operation, low maintenance cost, no skilled operator needed. Peerless Metal Separator Co., New York, N. Y. (36)

HOIST. New 8,000-lb. line pull hoist made by Clyde Iron Works, Inc., Duluth, Minn., features accessibility of all wearing parts, power economy, equalized linkage for smooth friction engagement and release, and large diameter brakes for accurate load control. (37)

ELECTRIC DRILL. Combination electric hammer and drill, the "Do-All", does 3 different types of work; (1) drilling concrete and masonry, (2) drilling metal and wood, and (3) driving, grinding, buffing and wire wheels. Wodack Electric Tool Corp., Chicago, Ill. (38)

SHAFT SEAL. Allis Chalmers, Milwaukee, Wisc., has developed the "Equiseal" stuffing box to eliminate leakage on its process pumps. It is a radially vaned sleeve which rotates with the shaft to create a pressure which equalizes the suction pressure. (39)

PROTECTIVE COATING. "Tinallium Pro-Tex-It" provides corrosion and rust control for practically all basic materials, porous and non-porous. It is guaranteed harmless to personnel and equipment, works in a temperature range from 75° F below zero to 500° F above. American Sand-Banum Co., Inc., New York, N. Y. (40)

MICRO-PHOTO PRINTS. Sharp, clear miniature prints measuring 4 x 6 in. (or larger if desired) can be produced from the negative microfilm of drawings measuring up to 24 x 36 in. Makes drawings suitable for easy filing. Micro-Photo Service Bureau, Cleveland, Ohio. (41)

FILTER FABRIC. Tests are reported to show that Fumeall, a combination of virgin wool and Dynel, a synthetic, will last three times as long as conventional all-wool fabrics in filtering fumes, dust, smoke and some liquids. Portland Woolen Mills, Portland 4, Oregon. (42)

TONG TEST AMMETERS. Measures a.c. or d.c. instantly and accurately by encircling the conductor with the tongs and closing them. The reading is instantly registered on the scale. Tongs open by a slight pressure by one finger on the trigger and are self closing. Weighs only 2¾ lb., eliminates breaking of the circuit to measure current. Columbia Electric Mfg. Co., Cleveland, Ohio. (43)

MIDGET SUBSTATION. Midget load center unit substation is especially designed for low voltage, regulated a.c. lighting and power service. Called and Inductrol Power Pack, the unit incorporates in one steel housing, an air circuit breaker, a dry-type transformer and an air cooled induction regulator. Available in single or three-phase ratings from General Electric Co., Schenectady, New York. (44)

DEMAND OXYGEN UNIT. Completely self contained in a sturdy carrying case, the M-S-A-demand oxygen unit is put in operation merely by opening the cylinder valve and placing the facepiece on the patient. Oxygen is administered automatically as the patient's breathing requires it. Mine Safety Appliances Co., Pittsburgh, Pa. (45)

AIR CYLINDERS. Cylinders with diameters as large as 20 in., operating at pressures from 200 to 3500 psi., are rated at 15, 30 and 195 tons of lifting power. Miller Motor Co., Chicago, Ill. (46)

BIN VIBRATORS. Semi-noiseless vibrators are available in 4 models for use on hoppers as small as 20 cu. ft. up to bunkers holding hundreds of tons, operating from 44, 110 or 220 v.a.c. Syntron Co., Homer City, Pa. (47)

ELECTRICAL MAINTENANCE. Silver plating high amperage electrical connections on the job to prevent overheating due to oxidation, improves continuity of electrical service and reduces maintenance time and costs. Silver plating powder will not peel off and gives cool maximum conductivity for copper, brass or bronze contacts. One pound (cost: $11.50) will silver plate about 6,000 sq. in. Cool-Amp Co., Portland, Ore. (48)

PHOTO-COPYING. An easy, versatile system for reproducing letters, reports, office records, sketches, drawings, etc., is time saving and economical. You can use photography from planning to production with the Portagraph. Remington Rand, Inc., New York, N. Y. (49)

INDUSTRIAL OVEN. Ovens of any size, shape and heat capacity can be field assembled from standard parts by electrical maintenance personnel. Constructed from low-cost electric heater panels and standardized frame members, ovens combine high-speed radiant heating with temperature controlled convection for heating and drying up to 700° F. Jensen Specialties, Inc., Detroit, Mich. (50)

ROCK BITS. Rock Bit Sales & Service Co., Philadelphia, Pa., has added flat top, carbide insert 4-point bits to its line of crowned bits. (51)

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Montana *(Continued)*

of the activities of the AEC in the discovery of radioactive minerals, in which he mentioned the uranium prospects on the properties of the Elkhorn Mining Co., at Boulder, and the tunnel being driven by the Newmont Mining Corp. of New York, near Alhambra.

NEVADA

★Mr. and Mrs. Magnus Peterson, veteran prospectors and mine operators of Nye County, **have discovered high-grade ore in a vein near Horsethief Spring.** Mrs. Peterson picked up the first piece of float which led to the vein, and panning of the sample showed a tail of free gold. The vein varies from 6 to 12 in. in width and assays returned values as high as $218 in gold and $4.95 in silver. The hanging wall is hard, smooth rhyolite, but the vein itself is shattered.

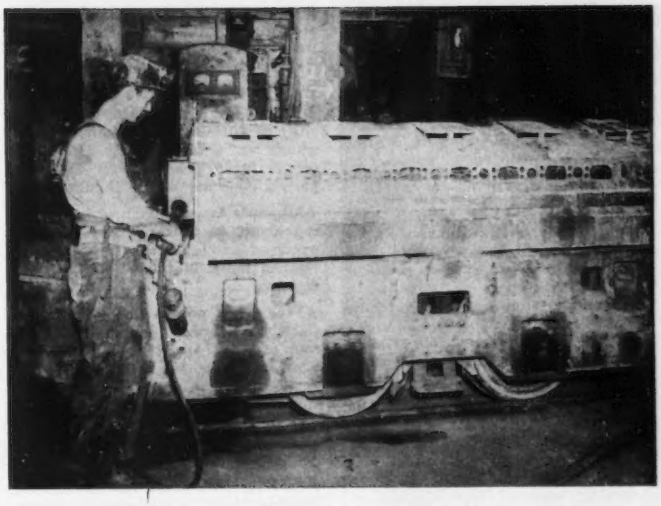
★**International Smelting & Refining Co. has asked for a $10,000,000 RFC loan to carry on development work on a new copper property near Yerington.** A new town west of the Walker River adjacent to the former Guild-Adams properties, and eventual construction of a big smelter are included in the plans. Surveyors have been working on the proposed townsite, and company representatives have made investigation of the water and sewer facilities and school accommodations. The land extends for more than one mi. along the east flank of the Singatse Hills west of Yerington, and drilling tests have revealed some exceptionally good ore. Mines in the same area produced 86,000,000 lb. of copper in past years.

★**Manganese, Inc., has announced plans for a $2-million manganese development** north of Henderson. The mill will have a capacity of 1,200 tons daily, Hewitt S. West, company president, said. Construction will start by April and operation is expected within 15 months.

The company has a 10-year contract with the Government to supply manganese alloy.

★**Fred T. Frost, of Ogden, has taken a lease on the Needle Peak fluorspar mine** in Lander County, which is owned by Marius Allard and Ted Johanson, of Battle Mountain. The property is at the head of Jersey Valley where road building and preliminary bulldozing on the surface have been under way for some time. Preliminary samples have showed the material to be of high purity.

★Louis and Phil Meyers, who have been mining a **streak of rich gold ore** on property in the Millet mining district, plan to concentrate activities from now on in development of a lead-zinc showing on another prop-



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Nevada (*Continued*)

erty 73 mi. north of Tonopah. The brothers plan to explore a parallel vein they recently discovered.

★Fred Vollmar, prominent Austin mining man, who is acting as field representative of a group of Californians, has concluded a transaction with George McGinness in which the group took over operation of two **claims in Grass Valley** in Lander County. The claims are known as the Grass Valley Tungsten Group, and Mr. Vollmar says that on one of them a crosscut of 30 ft. shows a vein running from .4 to 1%, traceable for 2,000 ft. The group also has under consideration the acquisition of various other known claims in the same area.

★The **deposit of copper ore on Old Glory Hill** near Kimberly, owned and operated by Consolidated Coppermines Corp., began production recently. According to A. J. O'Connor, general manager of Consolidated Coppermines, the deposit contains approximately 3 million tons of copper ore. About 25,000 tons of waste are being removed daily from the open pit, where 100 men are employed in stripping and mining operations.

★According to reports, **Copper Canyon Mining Co.** is milling more than 25 tons of lead-silver-zinc ore daily at the Copper Canyon mine.

NEW MEXICO

★Police and mine guards have been increased in New Mexico's **rich copper-lead-zinc-manganese mining district** in Grant County, and are on a 24-hr. alert as protection against possible sabotage and Communist infiltration. The county is expected to turn out a record volume of ore in the present year. About 4,000 miners are employed in the county.

★The **Oroquay Milling & Mining Co.**, Golden, is installing a $10,000 Stevens table for its mill handling gold and copper ore, principally gold.

★Three mills are **stepping up their output of lead concentrates** in the Hansonburg district east of San Antonio. Mex-Tex Mining Co., Inc., is producing high-grade jig concentrate of lead and high-gravity barite jig concentrate at its plant south of San Antonio; the Hurlow Mining & Milling Co., operating its jig mill 16 hr. a day out in the district, is turning out a 4% lead sulphite concentrate; the Portales Mining Co., at its jig mill in San Antonio, is producing lead concentrate. All the ore is coming from the district between Socorro and Carrizoao in the central part of the state.

★M. F. Drunzer and son are mining the Stauber deposit in the **Pastura mining district**, getting out from three to four 60-ton cars of silicous fluxing ore, containing 1.3% to 1.5% copper, daily. The company hopes to raise production to five cars a day. Shipments are going to the El Paso Smelting Works.

★**Peru Mining Co.** had added another shift of 40 men at its Hanover operations in Grant County. Lead-zinc ore is being produced for the company's concentrator in Deming.

★**Minerals Operation, Inc.**, is producing about 40 tons per day of high-grade lead-zinc-silver ore at the Hornet mine in the Eureka mining district.

★**Five major potash companies** in the Carlsbad district delivered 560,672 tons of potash salts during the third quarter of 1950, an increase over the same period in 1949. This will undoubtedly be exceeded in 1951 as the two new companies, Southwest Potash Co. and Duval Sulphur & Potash Co., swing into full production.

★Activity has been revived at the Harding mine, 8 mi. east of Dixon, where **valuable deposits of tantalum, lithium and beryllium ores** were worked during World War II. Arthur Montgomery, owner of the mine, is developing a mass of non-crystalline beryl, and has probably produced the largest tonnage of beryl in the country for the period, with about 200 tons of good quality material shipped. New Mexico Mining & Contracting Co., of Albuquerque, is mining lithium at the mine under contract with Montgomery. Shipments in 1950 were somewhat above 1,500 tons.

The following memorandum is inserted to help you keep the Washington alphabet straight.

AEC—Atomic Energy Commission, Gordon Dean, Chairman

DMA—Defense Minerals Administration (Interior), James Boyd, Adm.

DPA—Defense Power Administration (Interior), Clifford B. McManus. Adm.

DSFA—Defense Solid Fuels Administration (Interior), Charles W. Connor, Adm.

ESA—Economic Stabilization Agency, Allan Valentine, Adm.

MB—Munitions Board (Defense), John D. Small, Chairman

NPA—National Production Authority (Commerce), Wm. H. Harrison, Adm.

NSRB—National Security Resources Board, Stuart Symington, Chairman

ODM—Office of Defense Mobilization, Charles E. Wilson, Director (new over-all agency)

ODMa—Office of Defense Manpower (Labor) Robert Goodwin, Exec. Director (Regional Labor Management Committees have charge of preventing labor piracy, etc.)

NORTH CAROLINA

★Foote Minerals Co., of Philadelphia, has leased a large plant at King's Mountain, formerly operated by Solvay Process Division of Allied Chemical & Dye Co., and is reconditioning it to **process spodueme.** Dr. J. L. Stuckey, state geologist, says the company also has leased land areas adjacent to the plant and that the plant will go into operation in May if certain tests now being made are satisfactory. The North Carolina State Board of Conservation and Development was told that the plant will process spodueme to obtain from it a product believed to be important in the manufacture of the H-bomb.

★A special state-wide committee headed by S. T. Henry, of Spruce Pine, and Carroll P. Rogers, of Tryon, co-chairmen, both of whom are affiliated with mining operations, told the State Board of Conservation & Development recently that there is a **great need for advertising the state's mineral products.** It urged that the board sponsor a minerals museum on Government-donated land along the Blue Ridge Parkway in the western part of the state. The Minerals Resources Committee reported later that it would recommend State sponsorship of the museum which would be maintained by the Federal Government. It was pointed out that approximately 20 of the more than 260 minerals found in the state are being mined on a commercial basis.

OREGON

★**Exploration of nickel deposits in Nickel Mountain** in southwestern Oregon, with a view to mining low-grade ore, is planned by M. A. Hanna Co. of Cleveland, Ohio, as well as experiments in the most economical way of treating the ore. The company holds a purchase option on the mineral rights of the property, owned for many years by Edson F. Adams, Oakland, Calif., and his estate.

Normally the ore is too low-grade to make mining profitable, but defense needs are expected to create a demand that will justify operation; Oregon has the largest nickel deposits in the United States. At present, the Goverment is entirely dependent on deposits at Sudbury, Ont., for its supply.

According to F. W. Libbey, director of the Oregon State Department of Geology & Mineral Resources, the Nickel Mountain deposits have been known for more than 80 years. Auger tests were made in 1937 by the department and work was resumed in 1949 after the Hanna company leased the mineral rights.

The U. S. Bureau of Mines is exploring methods of processing the ore at its Albany, Ore., laboratory. At present two methods of recovery are

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used: a wet process by which the nickel can be leached out of other materials and direct smelting, with stainless steel as a primary product.

★Fay Bristol, president of the Oregon Miners Association, denies that a **"lumber steal"** is going on in southern Oregon in the name of mining. In an address to the Siskiyou chapter of the Society of American Foresters he defended the state's mining laws and declared there is no foundation in fact for the charge mining claims are being filed merely to obtain timber. He charged that there has been no enforcement of mining laws for 20 years.

★In a summary of **Oregon mining activity** in 1950, F. W. Libbey, director of the State Department of Geology and Mineral Industries, reports that the year saw little change in the state's mineral production, with non-metallic production continuing at a rapid rate, while metallic mining was at the same low ebb it has been since the end of World War II. While production figures for 1950 are not yet available, Mr. Libbey reported it seems unlikely that there will be any material change from 1949, when the state's total mineral production was valued at $22,479,000.

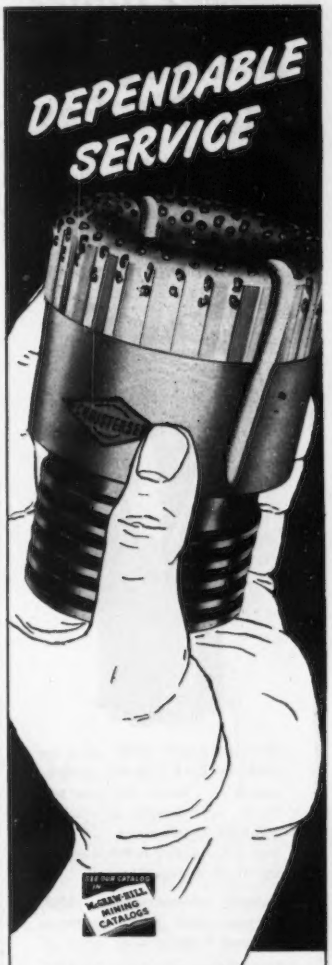
SOUTH DAKOTA

★**Homestake Mining Co.**, Lead, is reconstructing its crushing plants to provide a third stage of crushing. In the present plants, crushing is in two stages with 18-in. opening gyratories followed by 7-ft. standard Symons cone crushers. In the revamped plants, primary crushing will be in 30-in. opening modern gyratory crushers followed by 7-ft. Symons standard and 7-ft. Symons short head crushers. Reconstruction of the crushing plant at the Yates shaft is well under way, according to reports. When it is completed, similar changes will be made at the Ross shaft plant.

TENNESSEE

★**Electro Manganese Corp.**, Knoxville, is planning to construct a new chemical plant which would supplement the present Proctor Street plant and increase total output of metallic manganese to 300 tons per month, according to reports. The cost is estimated at $1 million. The company is seeking to purchase 17 acres of the Tarleton Institute property from the Knox County Court. Action on the proposed site purchase is expected early this month.

★Furnace operations of the Tennessee Valley Authority's phosphate processing plant at Godwin, near Columbia, will be changed from fuel oil to natural gas in the near future,



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Tennessee (*Continued*)

with an estimated initial consumption of slightly less than 1 million cu. ft. daily.

UTAH

★According to reports in Salt Lake City, the **Howe Sound Co.**, which is setting up cobalt ore concentration equipment near its Blackbird mine in Idaho and a refinery at Garfield, is planning virtually to double its announced production prior to completion of its initial facilities. The Calera Mining Co., which is to operate the Blackbird facilities is currently installing a 600-ton mill scheduled for operation by mid-summer. H. H. Sharp, president of Howe Sound Co., reports the Calera subsidiary contemplates increasing the daily capacity of the equipment to 1,000 tons. "Certain Government guarantees" are being sought to insure this production boost, but no details can be given and no date for a Government decision can be predicted with any certainty, according to Mr. Sharp.

★W. H. H. Cranmer, president of **New Park Mining Co.**, reported that New Park has applied to the Federal Government for some $250,000 in assistance for its exploration and development program at Park City. The company is likewise reported to be preparing to present a request to Federal officials for assistance in exploration on the properties of the East Utah Mining Co., of which it has voting control.

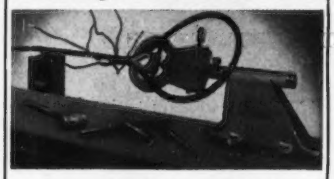
According to Mr. Cranmer, New Park was forced to neglect development work and turn all its efforts to ore production. In the postwar years, due to metal price drop, funds were not available for an adequate program of exploration and development.

★Seven representatives of the **Japanese mining industry** and Nipponese government bureaus connected with mine operations completed a lengthy inspection of Utah underground and open-pit operations in early January "amazed by the high degree of mechanization."

T. Ktasuki, vice manager of the Ashio Cu Mines of the Furukawa Mining Co. of Tokyo, acting as spokesman for the group, reported the inspection trip, made through the courtesy of Gen. Douglas MacArthur's headquarters, had been arranged to "view American methods in order to increase production and improve efficiency in Japanese operations."

In Utah, the group toured Kennecott Copper Corp.'s open pit at Bingham Canyon, the Garfield smelter, mines of the Park City district, and the Duchesne Tunnel being driven for the Bureau of Reclamation.

TORQUE MASTER



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WASHINGTON

★Mineral rights to 158 acres in the Northport area, adjacent to the Red Top mine have been acquired by **Grandview Mines**, according to Karl W. Jasper, of Spokane, president. Acquisition of 5,753 acres of deeded mineral rights in Stevens County had been announced earlier.

★**Howe Sound Co.'s operations at Holden** have been slowed down during a dispute over the date from which a pay incraese should be effective. A 10c. hourly pay increase had been made by the company despite the fact that the contract was not subject to reopening for wage negotiations until next July. John Curzon, manager, said copper concentrate production was cut to "75% of normal during the latter part of December" and that the mill operations were shut down for four days due to shortage of ore from the mine. The company agreed to make the raise retroactive to Dec. 1. The union insists on the date being Nov. 1.

★According to Wayne M. Wellman, Hanford CIO director, the Congress of Industrial Organizations will attempt again to invade **Hanford organized labor**, this time in a unit of its United Gas, Coke & Chemical Workers of America at the Hanford plants. Last spring the CIO tried to get an election to dispute AFL's rights as bargaining agent with the General Electric Co., but the AFL council refuse to open its contract thus not giving the CIO a chance at an election. The contract opens automatically this year.

★It was reported late in January that the Government was opening negotiations with **Chromium Mining & Smelting Corp.**, parent company of Pacific Northwest Alloys which now uses part of the Mead plant to produce ferrosilicon, for reactivation of the $20-million wartime magnesium plant. About three months would be required for converting the plant to magnesium production, according to Government officials, and about $1½ million would be needed for renovations. The plant which now employs about 250 men would require a staff of about 800 employees if the entire plant were converted to magnesium production.

★**Mineral production in the State reached an all-time high in 1948**, according to the biennial report of the Division of Mines & Geology, which came from Supervisor Sheldon L. Glover. Figures are not complete for the 1949-1950 output, but the totals are expected to exceed materially the annual average of $35,500,000 of the period from 1939 to 1948, even though the valuation of production will be lower than the 1948 figures. Eighty-five metallic mining properties were in production or in development stages for early production in

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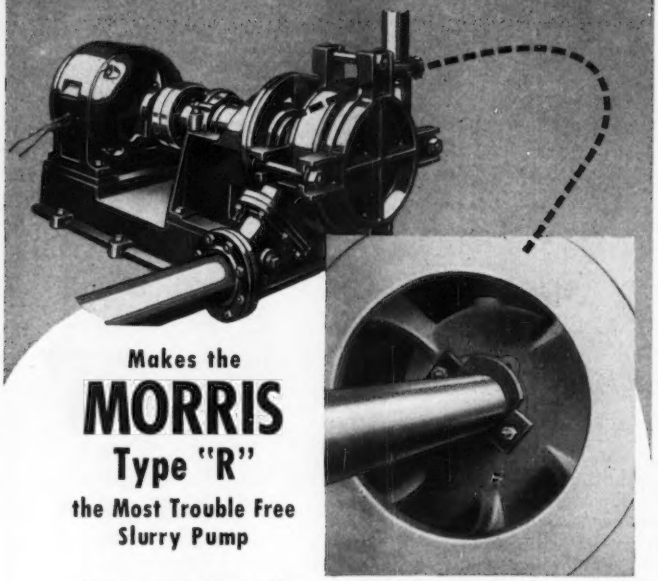

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Washington (*Continued*)

the State in 1950. This was 22 less than in 1949.

★Dead Medicine mine about 15 miles north of Colville, owned by **Silver Trail Mining Co.**, but under lease for the past year and a half to Robert Ramser of Spokane and A. B. Sylvester of Evans is having its zinc-lead-silver ore treated by Young America mill at Bossburg, and is shipping its concentrates to the Bunker Hill smelter at Kellogg, Idaho. Ore bunkers have been built, new machinery installed and 100 ft. of new tunnel has been driven. First shipments yielded lead concentrates valued at $434 a ton and zinc at $160 a ton. Assays of lead concentrates were 67.1% lead, 218 oz. silver and 2.7% zinc per ton. Zinc concentrates were 30.6% zinc, 9.7% lead and 22.2 oz. silver.

★**Pend Oreille's Mines'** new 600-ton unit near Metaline Falls went on a three-shift basis the first week in January. The Josephine is also operating three shifts and output of the two mills was expected to be increased to between 1,400 and 1,500 tons daily, according to Jens Jensen, secretary.

★**A hill of nearly pure silica,** the only deposit of its kind discovered in the Northwest, located southwest of Springdale, will be mined by Frank Eichelberger, mining engineer and J. W. Melrose, former geologist for the Chicago-Milwaukee, St. Paul & Pacific Railroad, both of Spokane. Plans have been announced for construction of a $100,000 treatment plant at Springdale as soon as weather permits. The State Division of Mines & Geology estimated the deposit to contain 6½ million tons of silica sand. With a sizing and treating plant of 250-ton daily capacity, this would be a 50-yr. operation. Twenty-five to thirty men will be employed. The quartz sand is used in making glass, chemicals, roofing, detergents, plaster and other products.

★Thanks to a single new mine, **Chelan County** became Washington State's leading gold producer in 1950, according to figures of the Bureau of Mines. The county produced 43,191 fine oz., of which two-thirds came from the Squilchuk mine of the Lovitt Mining Co. The mine produced equal amounts of gold and silver, with all milling done at the Tacoma smelter, 100 mi. away. Because the ore has a high silicone content, the smelter uses the ore as flux. The flux material pays for the milling, which brings out gold and silver through flotation and the use of the cyanide process. Supervised by Ed Lovitt, mining engineer of Vancouver, B. C., the mine has produced 60,000 tons of ore since Aug. 2, 1949. The firm has constructed a main ventilating shaft, main drift shaft and 9 stopes from 25 to 35 ft. along the drift of the orebody, which is at a 65° angle.

IN LATIN AMERICA

BRAZIL

★**A new Brazilian law** creating a National Research Council also forbids export of ores or compounds of uranium or thorium except on a government-to-government basis. Beryllium ore can still be exported, but only under special presidential authorization. The new law apparently puts a stop to recent attemps to ship quantities of monazite sands from Brazil to a firm in New York.

★**Exports of Itabira iron ore** through the port of Victoria rose 52% during 1950 to a total of 721,765 metric tons, The United States got 81% of the ore, and Canada was next, taking 10.3%. Holland, Germany and Belgium divided the rest. The Rio Doce Valley Authority, running the mine, hopes to double this output in 1951.

★**Brazilian users of sulphur** are complaining over reports that the United States has set a quota for exports to all of South America that would not fill even Brazil's requirements. Rio reports have it that the U. S. has set a quarterly quota for all of South America of 20,000 tons of sulphur, of which Brazil would get 11,000 tons. Brazil took 33,503 metric tons of sulphur in the first half of 1950 alone. There are no reserve stocks of sulphur in Brazil, and but little can be imported from Italy.

★Brazil shipped 101,958 metric tons of **manganese ore** during the first nine months of 1950, most of it to the U. S. **Cia. Meridional de Mineracao, a U. S.** Steel affiliate, was the largest shipper, claiming 79,315 tons.

CHILE

★**Quite a stir** has resulted in Chile over press reports of the above-market prices being paid in the United States for copper. Editorials in the newspapers, speeches in the Senate, and radio talks, all spread the idea that "The Copper Problem" was being handled unfairly to Chile. The country obtains about half its dollar exchange from the copper sold by the three American mining companies operating in Chile.

News of the price freeze on copper in January still further agitated Chilean copper miners, and many proposals have been put forward for increasing the income Chile receives from copper. The proposal heard most often is that Chile have a say in any price-fixing activity in copper; that the Chilean Government have a right to buy up to 10% of the American companies' output, to be sold in accordance with Chile's trade agreements. Chile wants a price higher than

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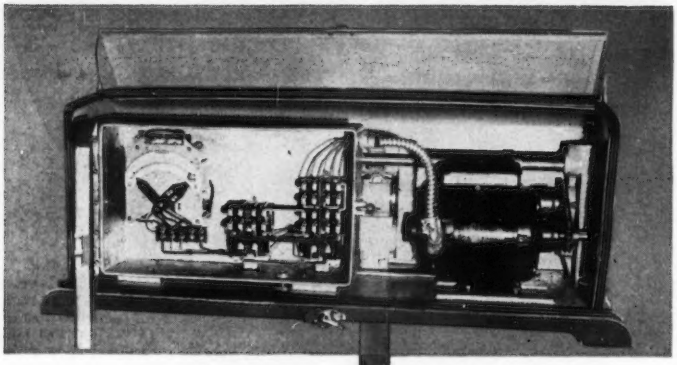

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Latin America *(Continued)*

24½c., the current market, because she feels prices of all the things she buys have gone much higher in proportion to the price of copper. Chileans also find the 2c. U. S. tariff irksome, and call continually for its removal.

Early in February, the Chilean Government announced its willingness to consider tax adjustments and other devices to assist American producers to expand production. Talks were under way during February among Government officials and copper company executives looking toward more harmonious relations in the copper industry for the future.

★**Chile will export** 30,000 tons of copper to England this year. There have been no exports of copper to England for the past two years.

★Corporacion de Fomento is trying to raise a loan of $2,500,000 in the United States to finance construction of a 20,000-ton-a-year **electrolytic copper refinery.** The Government would match this loan with a fund of 50,000,000 pesos.

COLOMBIA

★After a thorough examination of **samples of asbestos** from deposits near Yarumal, Anori, and Valdivia, in Antioquia, a Colombo-American company is reported ready to begin actual mining. Initial capitalization would be about 5,000,000 pesos. Production is planned for about 50 tons daily.

★**Gold output** is still increasing. November, 1950, output was 1,110,533 grams. A new Government regulation raises participation of the Government in all gold mined in Colombia from 2.45% to 2.73%.

MEXICO

★President Miguel Aleman has authorized the Nacional Financiera, S.A., to furnish half the 10,000,000 pesos needed to build **a new iron and steel plant** at Vera Cruz. The plant will raise Mexico's steel output by 30%. Ore will come at first from mines in Vera Cruz and Oxaca, and from a 250,000-ton stockpile at Vera Cruz. It is rumored that plans are on foot to develop iron mines in Michoacan and Colima.

★**Saudi Arabia** has contracted with the Mexican mint for production of $15,000,000 worth of silver coins. This is the third such minting by the Mexican Government for Saudi Arabia.

★**Mexico's silver production for 1950** was estimated at 60,000,000 fine oz. by the Mexican Mining Chamber. The group also forecast a 20 to 30% increase in output for this year. Mining men in general seem cheerful over the outlook, particularly in silver and lead.

★The Ministry of National Economy is beginning a **nation-wide survey** of mines and mineral deposits to try to find out what ores are in reserve and why some mines are being abandoned. A search will be made for new deposits particularly of silver, copper, lead and zinc. The group also has under consideration a special aid program for the Guanajuáto mining district, including assay offices and small, Government-operated mills.

PERU

★The Export-Import Bank announced on Feb. 1 an agreement with **Cerro de Pasco Copper Corp.** by which the company may draw advances up to a maximum of $20,800,000. The money will be used for a new electrolytic zinc refinery and other facilities on the company's property at Croya. When completed, the plant will have a capacity of 200 tons of refined zinc daily. The credit will be repaid in 20 semi-annual installments beginning July 15, 1956. Interest will be paid at a rate of 4½% yearly.

★**The Pachapaqui mining region,** (silver-lead), near Chiquian on the western slope of the eastern Cordillera in Northern Peru has been undergoing development this past year. The veins are said to be very wide, consisting of intrusions in limestones and quartzites resting on a granodiorite.

★**A copper orebody** is said to have been found on the outskirts of Ica in southern Peru. Pedro Cabrera, the owner, hopes to develop enough ore to build a mill. Chief copper mineral is chalcopyrite.

★**The Corporacion del Santa** is going ahead with plans to build an iron and steel industry in northern Peru near Chimbote. About 100,000,000 tons of high-grade iron ore has been developed at Marcona, 550 miles south of Chimbote. This tonnage will permit export of iron ore as well as shipments to the plant at Chimbote. The ore runs about 59% iron, 0.029% phosphorus, and 0.376% sulphur.

IN EUROPE

ITALY

★**The Italian Ministry of Industry** is studying plans to equip and modernize the 25 most promising Italian sulphur mines. Estimates of the funds required range as high as $8,000,000 in addition to $14,000,000 already approved for the job. If approved, the $8,000,000 will be spent for equipment outside the dollar area. ECA may use counterpart funds for this purpose as well. Italian sulphur deposits are among the world's richest and most easily accessible, and strong demand will certainly expand their output.

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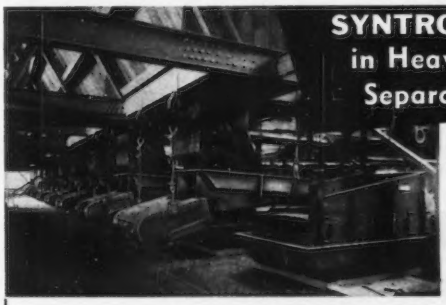

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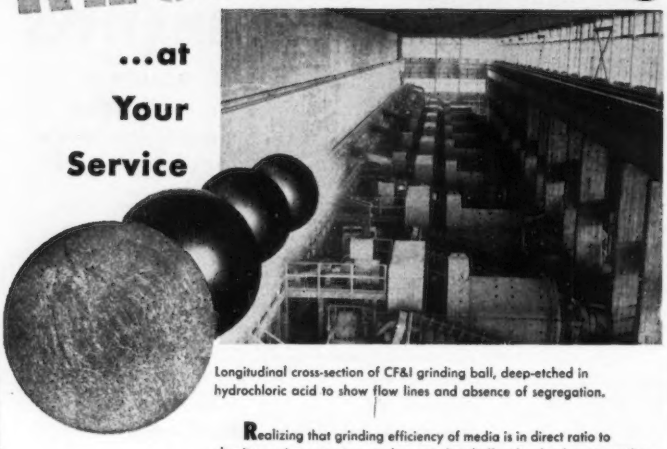

Longitudinal cross-section of CF&I grinding ball, deep-etched in hydrochloric acid to show flow lines and absence of segregation.

Realizing that grinding efficiency of media is in direct ratio to density, an inventor once made a grinding ball with a lead center and a steel shell. It was fine-sounding theory but commercially impractical for obvious reasons. At CF&I, research follows more reasonable lines. Our metallurgists and ore-dressing engineers, with long experience on grinding media, take into account the mill operators' problems, in working on improvements that will make CF&I forged steel balls still better.

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PRODUCTS OF CF&I

CF&I GRINDING BALLS and RODS

FRANCE

★**France is still an importer of lead,** but when new production in Morocco begins to come in this year, France hopes to have about 25,000 tons of lead available for export. Production of lead in France and French possessions came to about 100,000 tons in 1950. Zinc output came to about 90,000 tons. Demand, however, will run to about 120,000 tons in 1951. Having no national supplies of copper, France feels the copper shortage keenly. Last year saw an increase in copper scrap smelting to about 20,000 tons for the year. Imports of copper ran to 110,000 tons. Aluminum is the only nonferrous metal France can produce in quantity, and output is limited only by power supply. Total output for 1950 came to 85,000 tons. Exports of aluminum increased rapidly and reached a record total of 3,500 tons for the month of October, 1950.

★**France's shortage** of nonferrous metals is so acute that French manufacturers are beginning to ask their customers to supply the raw materials along with the orders they send in. At least, some brass fabricators have already asked their customers to supply a certain percentage of copper and brass scrap as a condition of filling an order. The quantity requested runs from 25 to 60% of the weight of the order. No relief is expected, short of world-wide allocation of metals.

SPAIN

★**Production of lead** in Spain is estimated at 2,748 tons average per month during 1950, against 2,280 tons per month in 1949. Considerable work is in progress to develop more ore in Linares, Santander, Murcia, and elsewhere. Small mills are being built in Granada and Murcia, and a smelter with an annual capacity of about 4,800 tons of lead is to be built in Lerida.

CZECHOSLOVAKIA

★Metal circles in London say that Czechoslovakia will sell **antimony for export** providing she gets some other metal in return. Some 99.6% antimony metal is understood to have been sold on this basis at a price equivalent to £278 per 1,000 kg. f.o.b. port of shipment. The circumstance is of interest in that it indicates a willingness of Soviet satellites to continue doing business with their former markets in the outside world.

YUGOSLAVIA

★**The Bor mine,** Europe's largest individual source of copper, produced 40,000 tons of blister copper last year. About two-thirds of this was exported for refining, the remainder going to Bor's electrolytic refinery. When a new electrolytic plant is completed at Bor, no blister at all will be exported. The plant will be half completed this year.

★A large low-grade copper orebody is being explored at Majdanpek in eastern Serbia. The ore is said to run about 1% copper and to carry 0.5 to 2 g. gold per ton.

ENGLAND

★**British aluminum interests** are studying site for a new aluminum smelter to be built either in Borneo or in the Gold Coast. The political situation in the Far East makes the Gold Coast location more attractive. If selected, the Gold Coast site would probably be near Ajena, where large bauxite deposits are known to exist. The site is owned by a subsidiary of the Anglo-Transvaal Corporation of South Africa.

How Can A Gold Mine Meet Rising Costs And Still Operate Profitably?

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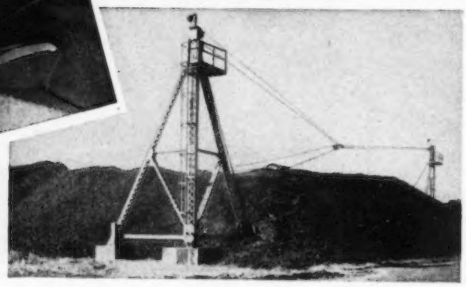

(Above) Sauerman Scraper stores feldspar in shed and reclaims to grinding mill. (Right) Coke for aluminum refinery is stored and reclaimed by Sauerman Scraper System using elevated tail bridle.

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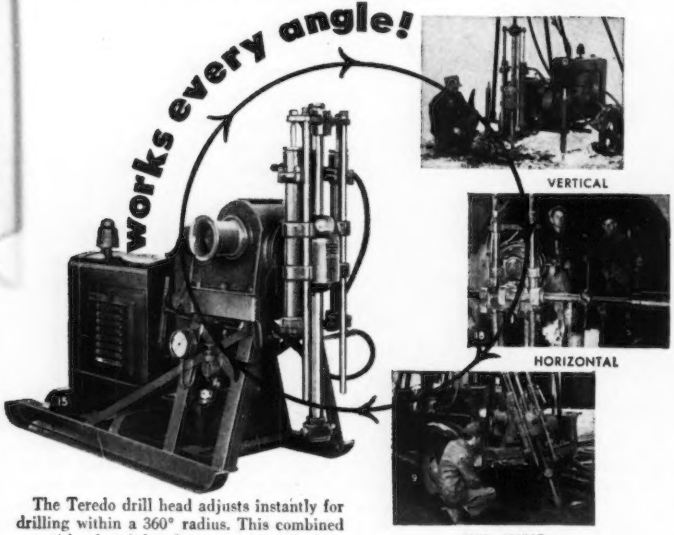

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IN THE PHILIPPINES

★**Mining operators are much disturbed** over political developments in the Philippines, particularly by import controls that threaten to hold back imports of machinery and supplies from the United States. Mr. M. R. Arick, of **Lepanto Consolidated**, presented data recently to the House Committee on Labor, showing the effect of proposed new laws on his company's 1949 income. If applied in 1949, these laws would have converted a profit of £10.45 into a loss of £0.27 per ton of ore mined.

★Despite the unfavorable political atmosphere, mine production increases. **Benguet-Balatoc** milled 72,954 tons in December, a new postwar record, and grossed $551,036 in bullion at the $35 price. **Atok-Big Wedge** raised output slightly to 14,260 tons milled, averaging $10.35 per ton. **Lepanto Consolidated** milled 31,195 tons with smelter return valued at $598,500.

★In the Surigao area, **Mindanao Mother Lode** reported $252,000 recovered from milling 9,600 tons in December, with an average value of $26 per ton. This unusually high value came from a high-grade streak on the lower levels.

★**Gold has sold** on the Manila open market at £140 per ounce, the equivalent of $70 at the official rate of exchange. Gold mines can sell 75% of their output in this market. The rest is sold to the Government at $35.

★**Acoje Mining Co.** shipped 5,175 tons of metallurgical chromite in December valued at $82,200. Consolidated Mines shipped 23,300 tons of refractory grade chromite to E. J. Lavino in Philadelphia.

★In a summary of the **Philippine manganese situation** prepared recently by Luzon Stevedoring Co., it is pointed out that only a little more than 20% of the industry has been rehabilitated since the war because of high production costs, marginal profits, and lack of capital. Production in the first half of 1950 was 16,000 tons. Of the output of the nine producing mines, **Luzon Stevedoring** and **General Base Metals** accounted for 12,000 tons.

★**Amalgamated Minerals**, owning important manganese deposits on Busuanga Island in the Palawan Group, has contracted to sell its output through Philipp Brothers of New York. An initial shipment of 1,400 tons was made late in 1950 with another 1,000 tons following in January. **Nestorio N. Lim**, until recently chief valuation engineer for the Philippine Bureau of Mines, is consulting engineer for the company.

★**A new iron ore deposit** has been discovered on Marinduque Island. Out-

crops are reported to show ore carrying 69% iron with low phosphorus and sulphur. Over 100,000 tons of magnetite and hematite float are exposed on the surface. The deposit is northwest of the Gold Star mine.

IN AFRICA

★**Relations between labor nad management** are better in South Africa than in any mining industry overseas, according to J. F. Reid, general manager of Rand Leases mine, just back from a seven months' tour through mining districts in the United States and Canada. Mr. Reid characterized relations between labor and management in most of the mines he saw as "open warfare." Mr. Reid thought the U. S. mines were ahead of the South African mines in mechanization of mining, although it would be difficult to apply U. S. methods to Rand conditions.

★**International Nickel Co. of Canada** has applied for a special and exclusive prospecting license over a square mile in the Dodoma and Kondoa districts in Central Tanganyika.

★The concrete ventilation partition in No. 4 shaft at the **St. Helena mine** in the Orange Free State has been completed. Shaft stations on the 6, 8, 10, and 12 levels, the main pump station, and the conveyor crosscut are being cut. St. Helena's mill is likely to be completed in the next six months. Mills are also going up at Freddies North & South Lease Areas, Welkom, Western Holdings, and Free State Geduld.

★Shaft-sinking crews at Merriespruit mine have **set a new record** for the Orange Free State with a January advance of 351 ft., 344 ft. of which was concrete-lined. The previous record was held by a crew at the Harmony mine with 306 ft. in one month.

★**Daggafontein mines** led South African gold producers last year with an output of 732,432 oz. Average yield of 2,904,000 tons mined by Daggafontein in 1950 was 5.044 dwt. per ton. **Blyvooruitzicht** was second with 727,090 oz., but it had to mine only 994,000 tons of ore with an average yield of 14.630 dwt. Blyvoor made a working profit of about £2,809,167 and paid dividends totaling £3,200,000 on a capital of £3,000,000.

★About half a million tons of chrome ore, badly needed in the U. S., is stockpiled idly in Rhodesia awaiting rail shipment to the coast.

★**Sir Ernest Oppenheimer,** head of the Anglo-American Corporation group of companies, announced recently his retirement as a director of eight active mining companies in order to ease the burden he is carrying. He remains, however, a director of some 35 other companies.

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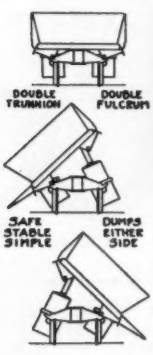

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IN AUSTRALIA

★**If the Far Eastern crisis** engulfs a wider area, Australia's mineral wealth will be counted among the assets of the free world which may help it to arm itself against Communist aggression.

Already Australia has moved close to the top as its suppler of tungsten minerals; unfortunately not so much by dint of greater production effort as by a geological and strategic accident which placed much of the world supply behind the Chinese-Korean fighting lines.

Australia could make substantial contributions to the Democracies' supply of lead, zinc, tungsten, tantalum, and beach-sand minerals and could indirectly assist in easing demand pressure by attaining self-sufficiency in pig iron and steel, tin, and copper.

★**Although Australia was among the first** United Nations members to join in the Korean scrap, there is little evidence that the metal industry has attempted to back up this effort or to plan for commitments which may yet spring from it.

Figures just released by the Commonwealth Statistician disclose a serious production lag in the period immediately following the Korean flare-up. With the exception of pig-iron production, which amounted to 602,900 tons for the five-month period ended November last compared with 48,700 tons in the five months ended June, metal output showed an all-round decline.

Copper production fell from 3,900 tons in the three months ended June to 2,600 tons in three months ended September. Output of lead and bullion, for four months to and from June 30, dropped from 71,800 tons to 66,800 tons. Zinc output, on a five-month basis, eased from 35,360 tons to 35,320 tons. Figures for comparable periods in past years do not justify the assumption that a seasonal factor is involved.

★**While this downward trend in base-metal production** has apparently been arrested at least up to the ore-dressing stage, there is no sign of a determined effort to upset the static pattern of mineral exploitation which was laid immediately after the last war.

The blame for this neglect is shared by government, labor and management.

Diplomatically, the Menzies government has probably shown more pluck in support of an unflinching United Nations policy in the Far East than any other member of the British Commonwealth. It was the first to give active support to American troops in Korea. It has refused to deal with Red China and it has declared itself against appeasement. Yet it does not seem to know its own mind as far as industrial mobilization is concerned. One reason for this indecision is that cutbacks in the civilian sector of the

commodity rationing and price controls. Even without feeling the ax of government intervention, practically every industry is short of manpower, materials, equipment, transport, fuel and power.

★**The present stagnation** in the metal-mining industry is in large measure the backwash of long-standing government policies on taxation, tariffs and prices.

Australian mining taxation makes scant allowance for the erosion of capital through exhaustion of wasting assets and through monetary inflation. It penalizes the diversion of undistributed profits to reserve, making it difficult for mines to provide for replacement, modernization and expansion out of depreciation reserves whose real value is shrinking rapidly. Australian tax legislation does permit accelerated depreciation of new equipment—up to 40 per cent in the first year—but in the mining industry this concession is of questionable benefit because of the violent fluctuations in metal prices and profits which are the industry's traditional lot. An initial tax allowance for accelerated depreciation may lead to a disastrous pay-off in later years should taxation rates and profits go up.

Recent Australian governments have made a fetish of coddling uneconomic and, partly, inessential manufacturing industries behind a safe shelter of tariffs and other import penalties. This protectionist policy has compelled the mines to compete for scarce labor with mushrooming manufacturing industries, a tug-of-war in which they came out second-best. While only 2,600 more persons are emloyed in mining and quarrying than in 1939, the factory payrolls have grown by 350,000.

★**The government's policy of subsidizing manufacturing industries** and consumers at the expense of the coal and metallurgical industries by denying them full international market prices for their products on domestic sales has not only discouraged production expansion, but has resulted in wasteful use of valuable metals. As an inflation-fighting device this policy has been of doubtful value because domestic production of coal, cement, pig iron, steel, copper and tin has fallen so far short of requirements that the average price to consumers has come to be increasingly governed by import costs.

★**Though labor relations in the metal-mining industry** are less turbulent than in other Australian industries, it has not be able to escape the crippling blows of constant work stoppages in the coal mines, railroads and shipping ports.

There is not only a shortage of labor, but the existing labor force is occasionally resorting to grotesque de-

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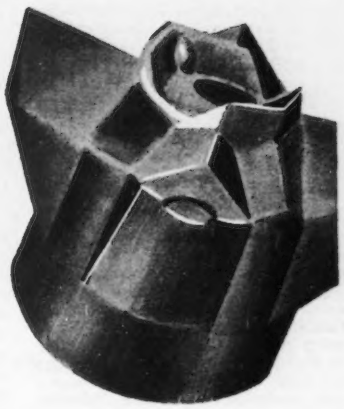

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Australia *(Continued)*

vices to keep newcomers out. Bitter memories of the depression of the thirties have warped the economic commonsense of the Australian union man. It has become an obsession with him to beat the next depression by not working himself out of his job this time. Though Australia has entered a period of forced-draft population growth by immigration, he remains suspicious of the concept of secular economic expansion and refuses to be carried away by what he believes to be a deceptive upward swing in the business cycle.

★Some managements have adopted a similarly static outlook in regard to **production planning.** The favorite objective cited in board chairmen's addresses to stockholders is to secure "stability for the industry." While many managements are now willing to plan in the long shot for the extra demands which a growing economy must make on the mineral industry, they are chary of taking chances on the present metal boom. Back of this is the fear of being saddled with top-heavy assets and an oversized labor force when the market snaps back.

WESTERN AUSTRALIA

★In accordance with instructions from London head office, **Paringa Mining and Exploration Company's** mill ceased operations in January 17. Announcing this, Mr. K. Truscott, the mine's general manager, stressed the belief that the closing of the mill did not necessarily mean the end of the mine. A comprehensive development program had been launched, diamond drilling of leases had been planned and a detailed and thorough survey of the company's properties would be carried out. Mr. Truscott explained that Paringa in common with other gold-mines had been seriously embarrassed by mounting costs in the face of a fixed price for its product. During recent months the company had paid out large sums for mine development for which as yet it had received no return.

★With the acquisition of North Kalgurli United leases, **North Kalgurli (1912) Ltd.** now controls a continuous length of 1½ miles on and beyond the Golden Mile. Ore reserves were last reported at 2,359,498 long tons. The mine's four 12 ft. x 4 ft. shafts have become inadequate. A new shaft being sunk near the North Kalgurli shaft is to be about 27 ft. x 7 ft. It will be opened down to the 1,500-ft. horizon from existing workings.

★In the year ended October 31 **Norseman Gold Mines N.L.** operated again on pyritic ore, but the mine plans to begin a gold exploration program as soon as equipment is available. It treated 61,214 long tons of pyritic ore compared with 48,005 tons in the previous year. The company hopes to be in a position soon to provide sulphur for all sulphuric acid requirements in Western Australia. Proved and probable ore reserves have increased from 72,300 to 107,300 tons of a sulphur content of not less than 25%.

VICTORIA

★Victorian gold production in 1950 dropped by 8,939 oz. to 59,487 oz., the lowest yield since 1944. The poor result was partly due to the fact that two big producers, Al Consolidated and Morning Star, worked on ore far below the grade that had made them outstandingly rich in the past. Alluvial production remained below earlier expectations as completion of the new dredge at Amphitheatre was delayed by shortages of equipment and labor.

★In 1950, nine companies in the **Bendigo field** decided to wind up. In addition to North Deborah, which produced 9,038 oz. last year, only two other mines remain active.

★Only 25 miles from Melbourne, an extension of the original **Black Cameron mine** at Smith Gully, near Panton Hill, has produced crushings assaying nearly 2 oz. per ton.

NEW SOUTH WALES

★Lead and zinc production by **Zinc Corporation** and zinc production by **New Broken Hill** were lower in 1950 than in the preceding year. Zinc Corporation treated 389,993 tons (439,949 tons in 1949) for concentrates containing 57,082 tons of lead (61,442 tons), 1,160,077 oz. of silver (1,291,897 oz.) and 75,619 tons of zinc (86,481 tons). New Broken Hill treated 165,685 tons of ore (175,150 tons) for concentrates containing 13,727 tons of lead (13,042 tons), 310,719 oz. of silver (274,218 oz.) and 38,137 tons of zinc (38,830 tons.) The only mine in the group likely to report a higher output for 1950 is **Broken Hill North.**

IN INDIA

★Intensive research work is going on in India to increase the country's output of **thorium, titanium, beryllium, and zirconium ores.** The Government is setting up a mill to process beach sands in southern India that are known to contain thorium and possibly uranium. India has the world's largest sources of beryl, large deposits of which have been discovered in Rajputana. Titanium is found in the crystalline rocks of southern India and in the mica deposits of Bihar and Orissa. In 1938, India produced 252,000 tons of titanium ore, but data on present output are not available. Zirconium is found with ilmenite in the beach sands of Travancore.

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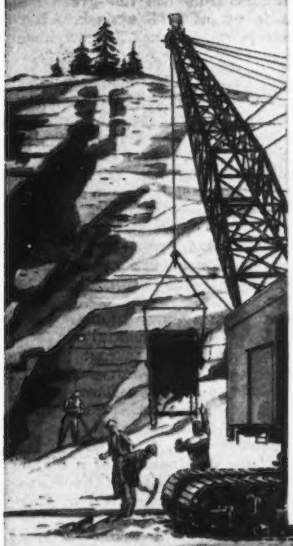

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IN CANADA

- Steep Rock Iron Expands Reserves
- Barvue Drilling Shows More Zinc
- Pinchi Lake Mercury May Reopen
- Teck-Hughes Seeks New Venture
- Japan Wants B. C. Iron Ore

BRITISH COLUMBIA

★Both bust and boom elements appear to face the **British Columbia mining industry**, according to reports to the annual meeting of the B. C. & Yukon Chamber of Mines at Vancouver. An unparalleled period of expansion is being entered by the industry as a result of high prices for base metals, Frank E. Woodside, manager, reported, with at least 12 new mills planned or under construction (E&MJ, Jan., 1951). In addition, at least 200 properties are under investigation that may lend to reopening of old mines or development of new deposits. Some 31 companies have been organized in recent months to raise capital for mining ventures. About 500 prospectors were in the hills last summer, and important discoveries have been reported.

On the other side of the ledger was the statement of M. M. O'Brien, chamber president and managing director of Bralorne Gold Mines Ltd., that unless there is an increase in the price of gold or more Government aid, a number of B. C. gold mines will be forced to close. In his annual report, he said: "Gold mines have been operating on a rapidly diminishing margin of profit, some mines losing money while depleting their ore reserves. This condition cannot continue."

★**Kootenay area of eastern B. C.** was the busiest mining camp in the province in 1950, J. W. Peck, mines inspector, told the annual meeting of the Chamber of Mines of Eastern British Columbia at Nelson. Of more than 90 operators, 70 shipped ore. They employed 1,000 men. Three new mines were started, but two main gold producers, Kenville and Sheep Creek, ceased operations, and with the exception of a few small producers, gold output was at an end. Production of silver, lead and zinc properties in the district increased in 1950 over the previous year, equaling 1949's increase over 1948.

★**A new all-time high price for quicksilver** may soon make it possible to reopen the mercury mine at Pinchi Lake, in northern British Columbia, it is reported. The mine, owned by Consolidated Mining & Smelting Co., was closed down after the last war when prices skidded. So far, CM&S has made no announcement, but the company recently allocated millions of dollars for expansion projects in B. C., and some of these funds may go towards a new start at Pinchi. During the last war the project was major supplier for allied explosives and other supplies. Cost of production of mercury from the thin-grade deposits is set at $108 a flask. After the war prices fell to $70, now have risen to $233.50.

★British Columbia has received offers from **Japanese iron and steel industry** for purchase of local iron ore, because of cutting off of Manchurian supplies due to the Korean War, and operators of promising properties are planning a thorough diamond-drilling program to prove up presently indicated iron ore reserves. Canadian Collieries (Dunsmuir) Ltd. reports inquiries from Japan for quotations on price, quality and amounts available.

Other side of the iron ore picture is the apparent willingness of Government officials, both provincial and federal either to aid or promote B. C. development of ore reserves. B. C. Mines Minister R. C. MacDonald, noting increased market possibilities, with about 115,000 tons of steel a year required in B. C., reports "real promise" for development of a major steel industry and says "there are certain iron ore properties in this province which have been held unworked since 1875. I would be prepared, particularly in view of the present national emergency, to consider measures which could make it possible to develop these properties." At the same time, Federal Fisheries Minister R. W. Mayhew, of Victoria, B. C., advocated a survey of iron ore reserves and indicated the Ottawa government might be prepared to assist the province in such a program. He reported federal Trade Minister Howe was interested in development of steel industry in B. C.

★Copper-zinc mineralization on the McVicar property near the **Britannia mine** on Howe Sound will be investigated this year by Surf Inlet Consolidated Gold Mines, Ltd. Preliminary drilling has yielded sufficient information to warrant an extensive development program, according to R. P. Mills, vice president. The diamond

drilling has partially explored two of the seven areas of copper-zinc mineralization which have been traced for more than 8,000 ft. Preliminary survey has been made for a 5-mi. road to connect the property with Squamish.

★Latest work at Rocher de Boule mine of **Western Uranium Cobalt Mines, Ltd.**, near Hazelton, has added 150 ft. of 6% copper ore to No. 2 vein, No. 2 level. The underground program is continuing through the winter.

★Scranton Consolidated Mining Co., of Portland, with properties near Ainsworth, plans **a diamond drilling program** to prospect the surface and underground character of the vein system, traceable for more than 2 mi. on the surface. Plans are complete for ore-loading facilities on the lakeshore, 8 mi. south of Kaslo. New buildings have been erected at the mine. So far operations have been confined to the Sunset Lake end of the property.

★Cronin Babine Mines, Ltd. has purchased the **Central Zeballos mills** and is planning to install it soon at the Cronin mine near Smithers. Initial output rate will be 60-75 tons daily, with a crushing plant of 100 tons daily. Harry A. Thielman, now installing a mill at Yale Lead & Zinc property, will supervise installation. Average Cronin millheads on mine-run ore are: 16.4 oz. silver, 9% lead, 10.25% zinc, 0.25% cadmium.

★**Van Roi Consolidated Mines, Ltd.**, has purchased a 100-ton mill and mill construction will start in April at the company's holdings near Silverton, with production expected in August. Diamond drilling at the mine has added 7,000 to 10,000 tons of accessible ore to reserves. New ore appeared to be a downward extension of the ore opened on No. A and No. 1 levels 500 ft. above. Drilling is continuing.

★**Silver Standard Mines, Ltd.** has recovered a 4-ft. diamond drill intersection of rich ore in the No. 6 vein some 200 ft. below the 1,300 main-haulage level. This is the first diamond drill hole in the present operation. Length of the hole is 266 ft. and true width of the intersection 2.3 ft., with assay of 0.36 oz. gold, 223.8 oz. silver, 31.5% lead, 19.6% zinc and 0.274% cadmium. Immediate sinking is planned of a three-compartment shaft vertically in the footwall of No. 6 vein from the main-haulage level to a depth of 500 ft.

★Drilling on a new **high-grade zinc orebody** at Base Metals Corp. Ltd.'s Kicking Horse mine near Field has given an indicated ore width of 90 ft. averaging 19% zinc. The ore was cut between 68 ft. and 118 ft. below the north extension of the No. 1 production drift, when drilling returned an intersection of 50 ft. of zinc ore averaging 20% zinc. Another drill hole intersected 16 ft. averaging 19.2% zinc. Drilling is continuing to outline the new orebody.

★**Hamil Silver-Lead Mines Ltd.** is preparing for production. With sufficient ore developed to warrant mill construction, Harry K. Kenward, managing director, says application will be made for release of stock to finance the project.

QUEBEC

★**Sullivan Consolidated Mines** estimated net profits at more than 30c. per share for 1950 compared with 6.9c. in 1949. Earnings for the year were from both gold and base metals; somewhat more than $1 million having been received in dividends on the company's shares of East Sullivan Mines while Sullivan's own gold mine in the Bourlamaque area showed a net profit of slightly more than $300,000. Net gold production at the latter property totaled $1.4 million in the first 10 months as against $1.58 million in all of 1949. Average recovery was $9.53 from 150,006 tons. The mill handled an average of 500 tons daily.

★A length of 1,100 ft. has been indicated by surface and underground diamond drilling for the gold ore zone found last year at the property of **Anacon Lead Mines** in Portneuf County. Little is known yet concerning its attitude and possibilities. Meanwhile, lead-zinc production continues satisfactory. December's output totaled 17,153 tons, valued at $172,570.

★Interest continues unabated in **widespread exploration of Barraute twp. Barvue Mines**, with the original discovery estimates indicated ore in excess of 4 million tons averaging 3.15% zinc and 0.94 oz. silver per ton. The estimate is based on the first 24 holes drilled from surface along a length of 850 ft. with both ends of the zone still open. Average true width of the structure is calculated at 109 ft. with ore potential of 8,500 tons per vertical ft. to a depth of 500 ft.

★Drilling is also in progress on the **Pershcourt Goldfields property**, adjoining Barvue to the north, on Frebert Mines ground to the west, and on that of Malbar Goldfields to the east.

★Other companies active or about to become active in the area include Bar Manitou Mines, financed by Lepine Lake Mines and Lavalie Mines, with ground adjoining Barvue to the south; Damascus Mines, planning geophysical survey before spring on claims 2½ mi. to the east; Barvin Mines, newly-formed on a group 3 mi. to the southwest; Matico Mines, adjoining both Barvue and Pershcourt on the east; and Bouzan Mines with a group to the northwest. All open ground in the area has been staked since the

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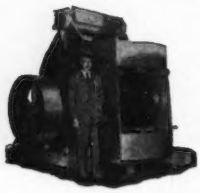

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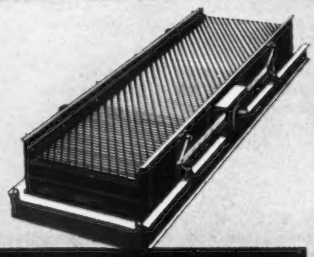

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For all the facts, write for Bulletin 1200

Canada *(Continued)*

Barvue discovery was made last fall.

★**New Calumet Mines** reported net profits for the 12 months ended Sept. 30, 1950, at 24.3c. per share, compared with 20.6c. in 1949. Ore reserves were down slightly at the fiscal year end, but new ore since discovered in depth drilling from the 1,350-ft. level has added 132,000 tons, bringing the present total to a probable 950,000 tons.

ONTARIO

★**Steep Rock Iron Mines** in northwestern Ontario continues to develop in a big way. Caland Ore Co., subsidiary of Inland Steel, had 11 drilling rigs in operation from the ice of the lake that overlies its optioned section, in the largest single drilling program on the Canadian records. The objective is to delineate 100 million tons of iron ore and, while no official reports have been issued, popular belief has it that the goal has just about been reached.

Adjoining the Caland section a 1,000-acre block has been optioned on a similar basis by a strong group composed of Steel Company of Canada, Bethlehem Steel Co., Youngstown Sheet & Tube Co., and Interlake Iron Corp. Drilling is scheduled to start this winter.

★**Femco Mines** has been incorporated to take over 18 claims in the Mattawa area, where preliminary work has indicated vanadium-iron-titanium lenses. Diamond drilling will be done this spring.

★Ten new levels are available for mining at the **Porcupine area property** of Preston East Dome Mines, following completion of winze-deepening last year. Expanded depth development is now in progress. Gold production in 1950 was approximately 57,000 oz. from the milling of 238,657 tons with average recovery slightly better than $9 per ton.

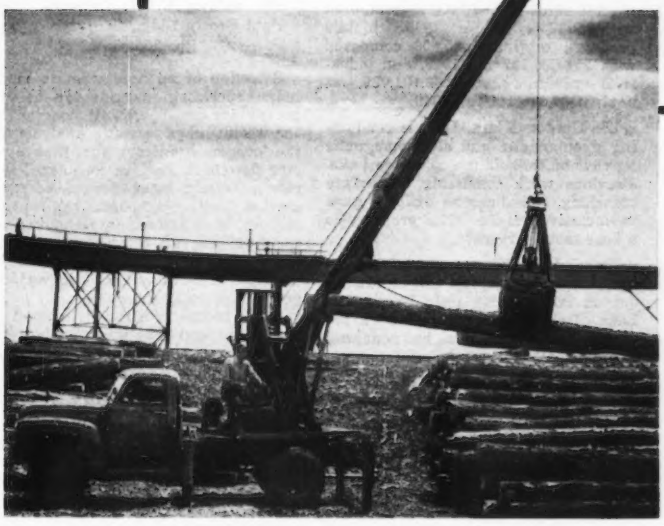
★More than 1.5 million tons of ore can now be estimated in the new "F" zone of **MacLeod-Cockshutt Gold Mines** in the Little Long Lac area. Grade averages 0.146 oz. gold per ton. The ore, which lies between the 8th and 11th levels, is adequate to keep the mill running at 1,000 tons daily for four years.

Little exploration has yet been done on the 8th level, where first work suggests a section quite up to expectations. On the 9th level results were disappointing.

★**Teck-Hughes Gold Mines** is expanding its search for new interests. Options have been taken on two properties recently; that of Lake Superior Mining Corp. near Hemo on the north shore of Lake Superior, where surface drilling in previous work returned encouraging gold values; and that of Eastville Gold Mining Co. in Courville twp., Northwestern Quebec. New com-

"Switching to Hydrocrane on Surface Gave us Five Extra Men Underground,"

Says Mine Superintendent



BUCYRUS ERIE HYDROCRANE

Here the company's H-3 Hydrocrane stockpiles mine timbers. Control is smooth and steady because every crane function is fully hydraulic.

"Our Bucyrus-Erie Hydrocrane actually took five men off surface jobs and enabled us to put them to work underground," states William Atkins, Supt., Cambria-Jackson Mine, Cleveland-Cliffs Iron Mining Company, Ishpeming, Mich. "We keep this handy rig busy every day, summer and winter, handling everything from mine timbers to hoisting a man up to grease a sheave block."

Atkins states that 80% of the crane's work is handling lagging and timbers — unloading from freight cars, stockpiling and reloading onto trucks for transfer to the shaft. Previously with hand labor it took four men around eight hours to unload a car of logs — now two men and the Hydrocrane do it it in 2½ hours — a saving of about 27 man hours. This is a tremendous manpower saving because the company uses approximately 950,000 bd. ft. of shoring per year.

Cambria-Jackson keeps Hydrocrane busy on these jobs too:

Digging ditches for sewer and water mains
Erecting steel trusses for a warehouse
Cleaning up ore spillage under the "pockets"
Loading coal
Placing conveyor machinery in shaft cage. Telescoping boom a big help here.
Loading iron ore into cars.

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Hydro-Mucker Sinks Mine Shafts The Fast, Mechanized Way — By switching from hand labor to the new Bucyrus-Erie Hydro-Mucker, the Negaunee Mine, Negaunee, Mich., speeded shaft sinking 35% with 30% less manpower. The unit consists of a hydraulically operated ⅜-yd. clamshell bucket, hydraulic pumps, electric motor and control bank. The bucket loads material from shaft floor to skip, car or other suitable conveyor for removal to the surface. Send for new bulletin.

BUCYRUS-ERIE HYDROCRANE DIV.
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Canada *(Continued)*

panies will be formed on both properties if options are taken up.

MANITOBA

★A preliminary estimate of mineral production of Manitoba for 1950 shows a total value of $33,146,629 compared with $23,839,638 for 1949. Metals produced total $25,045,603 compared with $16,826,197 for 1949, and industrial minerals total $8,101,026, as against $7,013,441 for 1949.

★**Lee Gordon Mines, Ltd.,** is conducting geomagnetic and electromagnetic surveys on its holdings at Vamp Lake. Previous work consisting of surface trenching and diamond drilling gave inconclusive results. The property is a base metal prospect.

★**Nickel Lake Mines** reports that an electromagnetic survey will be carried out on its property near Barrington Lake. Previous geophysical work revealed several anomalies, but none was found to contain commercial quantities of nickel or copper.

YUKON

★Yukon Consolidated Gold Corp., Ltd., **principal producers in the alluvial gold fields of the Klondike,** recovered $2,540,000 in gold by driver gravel dredging during 1950. This preliminary estimate compared with $2,173,405 in 1949 and the all-time high of $2,834,631 in 1942. All dredges were shut down for the year on Nov. 6 because of cold weather. In 19 years of operation Yukon Consolidated has produced $30,767,000 in gold.

★Mackeno Mines, Ltd., in the Mayo district, is undertaking an **intensive development program** aimed at mill construction. Property includes the MacLeod and Syme groups of 29 claims adjoining the producing Calumet and Hector groups of United Keno Hill Mines, Ltd., on the east. An adit, driven some years ago by Noranda Mines, Ltd., on the Syme group, has been reopened and enlarged and a crosscut is being driven an estimated 1,630 ft. to the MacLeod vein. A shaft was sunk about 100 ft. and some 200 ft. of drifting has been done on this vein since World War II by Karl J. Springer and associates. The present crosscut will contact the vein at an estimated depth of 350 ft. below the surface. A second adit is being opened on the side of Galena Hill about 225 ft. below collar of the MacLeod shaft to permit drifting on the MacLeod vein which is indicated to extend about 4,000 ft. to the Calumet boundary. Sampling on the vein gives an assay of 38.7 oz. silver, 10.8% lead and 6.4% zinc.

NEW BOOKS

INDUSTRIAL PLANT LOCATION. ITS APPLICATION TO ZINC SMELTING. By Carl Hayden Cotterill. Published through courtesy of American Zinc, Lead & Smelting Co. Book may be obtained from the author, C. H. Cotterill, 1600 Paul Brown Bldg., St. Louis 1, Mo. Price $5. Pp. 155.

Selection of an area wherein maximum operating margins can be expected for an operating concern is the result of a careful analysis of the economic factors for that specific flowsheet. Factors considered are raw materials, labor, power and fuel, market area, transportation, capital sources, laws and taxes, technological requirements, all in their geographical variations. Large differences in cost and profit may result in various geographic locations.

This book, profusely illustrated with maps and charts, shows how to determine the ideal location for a zinc smelter after weighing all the factors listed above. A case study demonstrates the application of principles set forth in the text. The discussion of economic factors affecting the zinc industry is so thorough, that the text might well be sub-titled "The Marketing of Zinc."

REPORT PREPARATION — INCLUDING CORRESPONDENCE AND TECHNICAL WRITING. Second edition. By Frank Kerekes, Assistant Dean of Engineering, Iowa State College, and Robley Winfrey, Professor of Civil Engineering, Iowa State College. Published by the Iowa State College Press, Ames, Iowa. Pp. 448. Price, $6.90.

"The report is a standard tool for transmitting ideas".—So says the opening paragraph of this book, and thereafter the authors do a good job of analyzing the elements of a good report. Subjects covered in the text include: collection of information; mechanics of style; format and arrangement; tabular presentation; preparation of illustrations; effective writing; letter reports and short reports; magazine feature articles and technical papers; oral presentation of reports; letter of application; editing, copyreading, and proofreading.

One section in particular on "readability" is worth careful study. Here the authors present a formula (developed by Rudolf Flesch, in his book, "The Art of Readable Writing") which may be used to determine quantitatively just how "readable" your writing really is. This formula has been used by leading national magazines to train editors to write more effectively.

To those who plan to write for technical magazines we heartily un-

Here's something more . . .

Case-histories No. 1 and No. 2 (previously published in this series) gave service tests involving the crushing of millions of tons of ore. Here are further cases taken from actual ore-grinding practice—you can rely on these data.

Case No. 3

Tests in Colorado, 1939: Molybdenite ore—quartz and feldspar, principal abrasives.

Service: " 98 " Marcy grate discharge type ball mills grinding $\frac{3}{8}$" siliceous ore to minus 100 mesh. Mill speed 20 rpm: balls charged were 3" dia.

Comparison: Lifter type clamp bars in low discharge grates, over a six-months period. Four bars of austenitic manganese steel together with four bars of chromium-molybdenum steel, normalised and tempered to 375 brinell. The bars were not worn flush with the grates when they were removed for weighing.

Results: Four manganese steel clamp bars lost 166lb. weight
Four Cr-Mo steel clamp bars lost ... 144lb. weight

In this test the manganese steel bars wore 15% faster than the chrome-molybdenum steel.

Case No. 4

Tests at a mine grinding low-grade copper ore, 1945-1949.

Service: Marcy 10′ × 10½′ grate discharge type ball mills grinding minus $\frac{3}{4}$"feed to 84% minus 100 mesh. Mill speed 18 rpm: balls charged were 2½" and 2" dia.

Comparison: Several sets of austenitic manganese steel liners, concurrently with one set of high carbon chromium-molybdenum steel liners normalised and tempered to 350 brinell.

Liner Type: Shell (barrel) liners, ship lap type; weight 47,000 lb. approx. per set.

Results:

	Tonnage ground	*Life-Days*
Manganese steel, average...	593,344	337
Cr-Mo Steel	667,308	379

The chrome-molybdenum steel liners wore 12% longer than the manganese steel liners.

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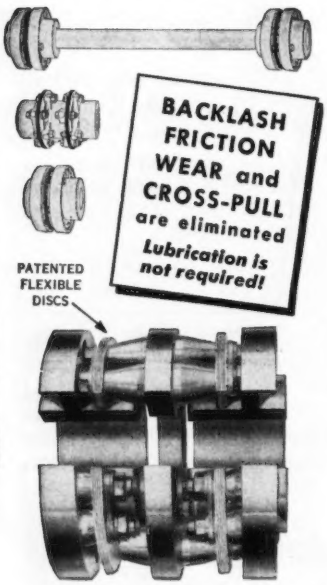

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New Books *(Continued)*

derscore this advice offered by the authors: "Magazine articles are necessarily shorter than a technical report for management written on the same subject. Brevity is gained by omitting details and background material. Magazines drive directly to the heart of the subject. Identical material is seldom presented in both tabular and graphical form. Original data are omitted, and the narrative of many trials and false starts. . . . The objective is to tell the story so that the reader can grasp at once the lesson, the know-how, the discovery, and the application to his own situation. . . . All he wants to know is what's new and how it can be done."

In short, this book should give engineering report presentation a much needed shot in the arm.

ECONOMIC ASPECTS OF ATOMIC ENERGY. An exploratory study under the direction of Sam H. Schurr and Jacob Marschak. Published for the Cowles Commission for Research in Economics by Princeton University Press, Princeton, N. J. Pp. 289. Price, $6.

As the sub-title implies this is an exploratory study of atomic power possibilities. Nevertheless it is thorough, authentic, and well worth reading—even at this early stage in the development of atomic power. Several chapters delve into the power requirements for the production of aluminum, chlorine and soda ash, iron and steel, phosphate fertilizers and other products. The authors evaluate the impact of substituting atomic power for types of power now in use in the production of the above items.

The chapters on cost of atomic power plants, atomic power and of atomic fuel are of exceptional interest. Two excellent maps showing the cost of generating electricity and the location of waterpower resources in all parts of the world are bound in the book.

Books Received

Gold from the Gold Coast. Published by the Gold Coast Chamber of Mines, 8 Great Winchester St., Londone E.C. 2. A report on the status of gold mining in the Gold Coast, including production figures and a map showing location of producing mines. Pp. 43.

Instruments Accelerate Research. A liberally illustrated booklet on spectrometers, polarographs, titrometers, pH and conductivity meters, gas analyzers, and various types of precision laboratory measuring instruments and research apparatus components. Published by Minneapolis-Honeywell Regulator Co., Industrial Division, Philadelphia 44, Pa. Pp. 82.

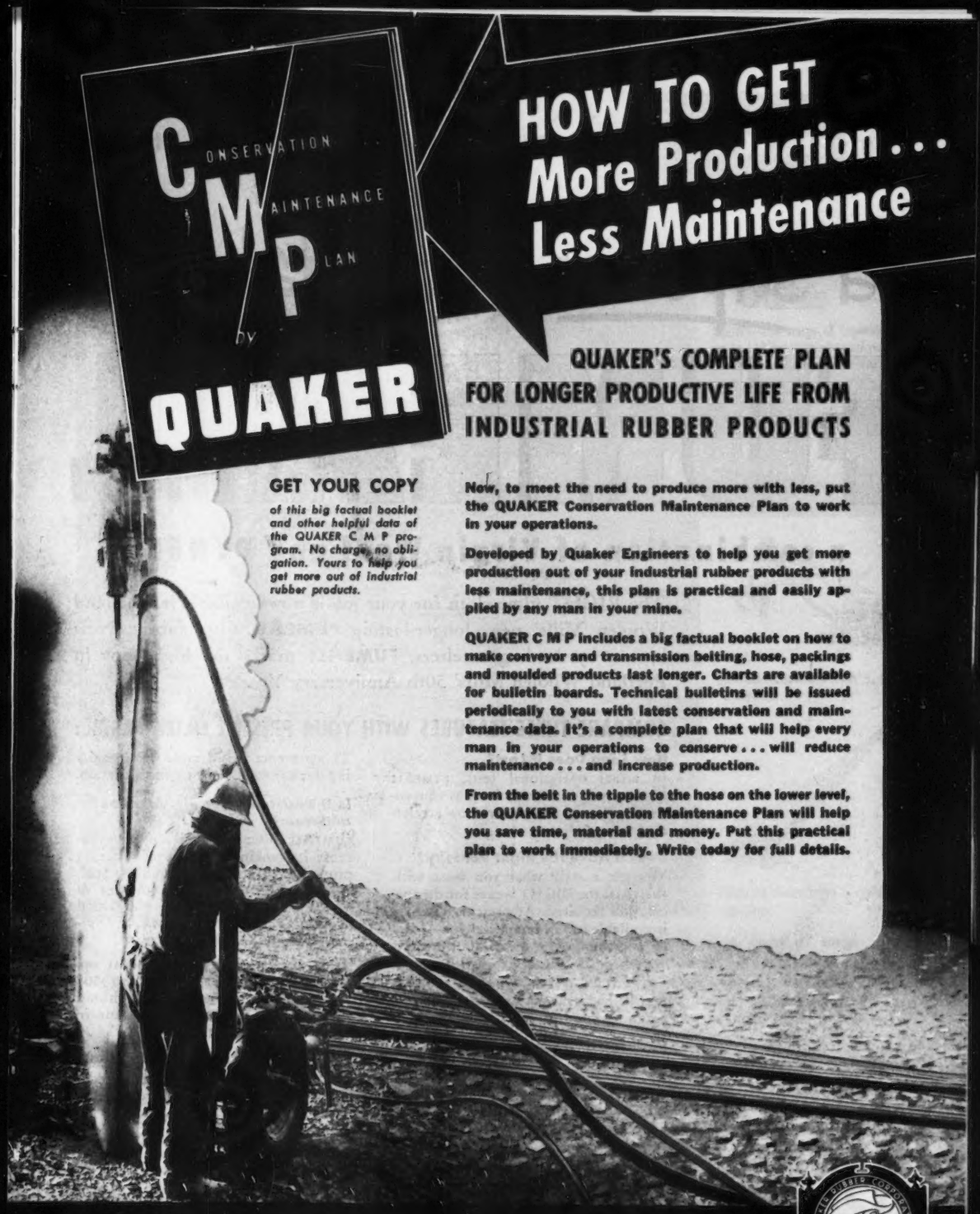
Plant Location Directory of Basic Chemical Products. This valuable booklet contains a geographical listing of plants in the entire United States making the following: sulphuric acid, sulphur, soda ash, salt and brine, nitric acid, industrial alcohol, hydrochloric acid, chlorine, caustic soda, and ammonia. Published by the State Planning Commission, Nashville, Tenn., as Publication No. 220. Pp. 15. Price, $1.

Standard Metal Directory. The newly-released 1950 edition covers iron and steel plants, ferrous and non-ferrous metal foundries, metal rolling mills, metal rolling plants, and smelters of non-ferrous metals. The directory contains special lists of the following: Distributors of pig iron, ores, and ferro-alloys; metal powder producers and sellers; smelters and refiners of primary and secondary non-ferrous metals, storage battery manufacturers; galvanizing plants; dealers in pipe and rail; importers and exporters. Published by Standard Metal Directory, 425 West 25 St., New York 1, N. Y. Price $15. Pp. 818.

Gold Extraction for the Small Operator. Basic principles of milling, amalgamation, and cyanidation are discussed in this booklet. Special emphasis is placed on such topics as testing cyanide solutions, precipitation, smelting of precipitate, and safety precautions for handling sodium cyanide. Available at Imperial Chemical Industries, Ltd., Cunard Bldg., Liverpool 3, England.

The Chemical Formulary. Vol. IX. Edited by H. Bennett. A collection of valuable, timely, practical formulas and recipes for making thousands of products in many fields of industry. Some included in this book are: fire-extinguishing foam; boiler-water compounds; adhesives for many materials; anti-freeze for radiators and fire extinguishers; bearing alloys; tungsten carbide; titanium carbide; cements for many materials; 56 pages of formulas pertaining to ceramics, glass, and cement; fire-proofing and flame-proofing compounds; gypsum board; lead coating for metals; many types of lubricants; permanent magnets (iron 78-82%, managanese 14-18%, vanadium 3-5%); lighter-flint alloy (50% cerium, 40% lanthanum, 7% iron, 3% other rare earth minerals); welding flux; welding electrode; rust-prevention compounds; detergents; paint; phosphorescent paint, and many items from pretzels to shark deterrents for ocean swimmers. Published by the Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Pp. 648. Price, $7.

Manual of Analytical Methods for the Determination of Uranium and Thorium in Their Ores. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Pp. 55. Price, 20c.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You get exactly what you want with **FUMEALL**: the RIGHT weave for the specific job required. At present, **FUMEALL** is available in 5 different weights—from the most porous 14-oz. to the least porous 24-oz. If you need a finer or coarser weave, you can have that, too. **FUMEALL** may be napped or unnapped to vary the length of run between clearings.

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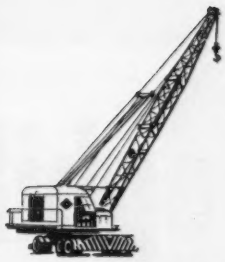

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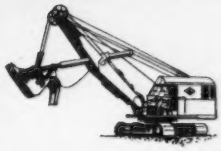

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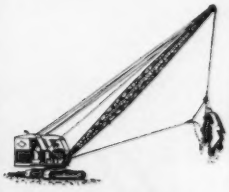

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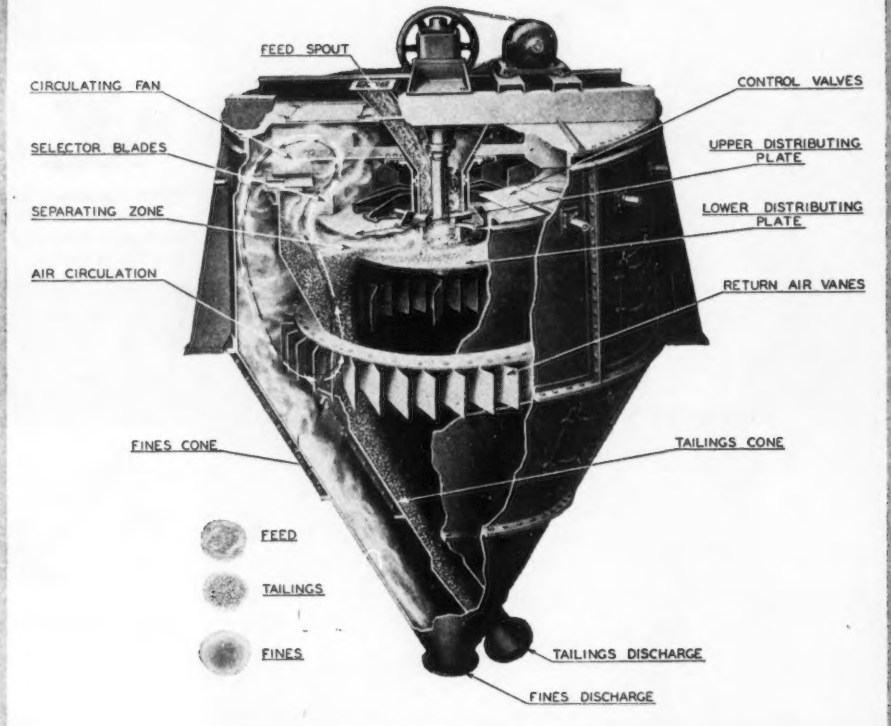

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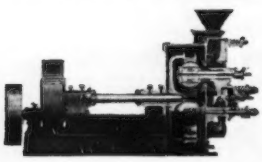

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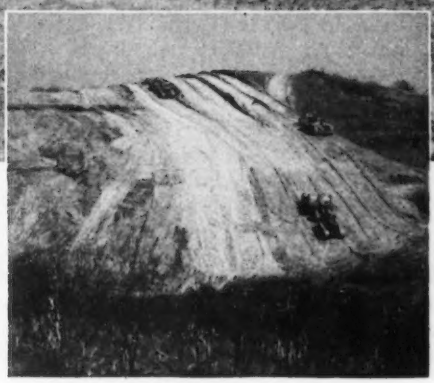
MORE POWER ON THE JOB—TD-24's deliver 148 maximum drawbar horsepower—more than any other crawler—work 340 days a year for Greasy Ridge Coal Company.



WORKING IN BOTH DIRECTIONS, TD-24's and scrapers make a 2000-foot figure eight every six minutes.

Strip mine operator scrapes off overburden in both directions—a 2000-foot round trip every six minutes—with the

TD-24

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Power, agility, easy steering, fast footwork—that's why the TD-24 pays off. See your International Industrial Distributor and get this kind of power working for you.

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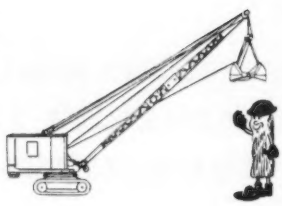

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JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT
This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.
This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.

These are the cost-reducing Blowers that give up to 100% more air

Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corp., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
283 Park Avenue, Worcester 2, Mass.

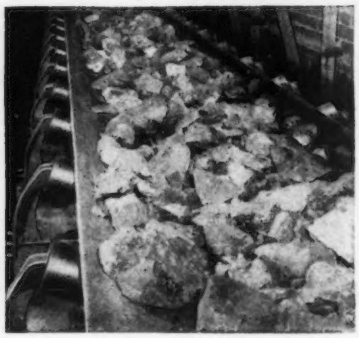
Please send.....Bulletin 130

Name .....

Company .....

Address .....

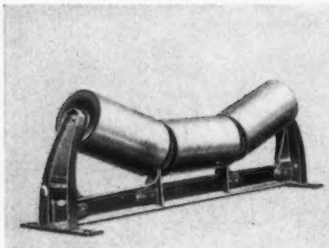
LINK-BELT engineering experience...



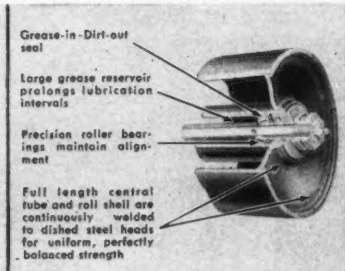
Nickel ore enroute to bin.

Overburden leaving iron ore pit.

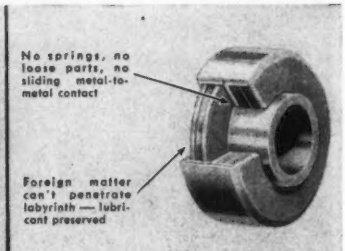
LINK-BELT quality components...



Standard for industry—L-B "100" Idler


Grease-in-Dirt-out seal
Large grease reservoir prolongs lubrication intervals
Precision roller bearings maintain alignment
Full length central tube and roll shell are continuously welded to dished steel heads for uniform, perfectly balanced strength

Less lubrication and adjustment


No springs, no loose parts, no sliding metal-to-metal contact
Foreign matter can't penetrate labyrinth — lubricant preserved

Grease-in-Dirt-out Seal

add up to your best bet in BELT CONVEYORS

In mines all over the world, LINK-BELT Belt Conveyors provide reliable, efficient materials handling

Get the finest in modern materials handling in your mine. It can be as simple as calling in a Link-Belt engineer while you're still in the planning stage.

Thousands agree Link-Belt builds the finest belt conveyors on the market today. More, it has the most complete line of components — all types and sizes — idlers, take-ups, pulleys, trippers, bearings and power transmission drives. Plus all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers, weigh larries.

Equally important, Link-Belt Belt Conveyor engineers can draw on the broadest materials handling background in the industry. They'll work with you and your consultants — help you come up with the right system for your requirements.

Call on your representative, or write us direct for the services of a belt conveyor expert.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 12.247-A

WORLD-WIDE SALES AND SERVICE OF HYSTER TRACTOR EQUIPMENT BY MORE THAN 400 "CATERPILLAR" DEALERS

"Caterpillar" dealers around the globe are Hyster tractor equipment sales *and service* stations. They *sell* the right tool for the job. Their factory-trained mechanics *service* the equipment when required. They supply genuine Hyster parts from well equipped stocks.

Hyster has made tractor tools for use with "Caterpillar" track-type tractors for more than twenty years; will continue to design and build quality products for the world's toughest work assignments.

HYSTER® COMPANY

Manufacturer of 29 Tools for "Caterpillar" Track-Type Tractors

2965 N. E. CLACKAMAS, PORTLAND 8, OREGON
1865 NORTH ADAMS ST., PEORIA 1, ILLINOIS

See your "Caterpillar" dealer for information about Hyster Tractor Equipment, or write for literature.

Every Air Hose With This Trademark

Assures Long Operating Life

Air hose economy is not measured in feet per dollar. The only true yardstick of air hose value is *service hours.*

Because every BWH hose has been developed, tested and field-proven to give the best possible combination of strength, safety, flexibility and damage resistance . . . *you get maximum service life.*

Whatever brand of hose you are now buying, you are paying for BWH benefits — so why not start getting them — *now?*

Today, contact your nearby BWH Distributor.

CONCORD AIR

An extra quality, exceptionally rugged hose for toughest use on air drill and pneumatic service in mines, quarries and construction jobs. Non-porous tube resists heat and oil. High tensile cotton yarn braid reinforce carcass. Tough grey cover resists cutting, gouging, abrasion. 7 sizes from ½" 2-braid through 2" 3-braid. 200 to 300 lbs. working pressure. Maximum length 50'.

BAY STATE AIR DRILL

For heavy construction work in mines, quarries, tunnels and wherever large size hose is required for long service. Smooth black tube resists heat and oil. Carcass of strong, rubber-impregnated multiple ply woven duck. Rugged, heavy-gauge red rubber cover resists severe weather extremes, cutting, abrasion. 9 sizes stocked from ½" to 4". Working pressures from 175 to 225 lbs. Maximum length 50'.

AUROCHS AIR

For portable air compressors, jackhammers, rugged industrial and construction work. Smooth, black, non-porous tube resists heat and oil. Carcass: multiple ply, rubber-impregnated, rugged woven fabric. Tough black cover resists weather and abrasion. Stocked sizes: ½", ¾", 1". 200 lbs. working pressure. Maximum length 50'.

TIGER AIR

Lightweight, flexible hose for general industrial and medium air service. Smooth black tube resists oil and heat. Carcass is strong, lightweight multiple ply woven fabric. Tough, black cover resists abrasion. Stocked sizes: ⅜", ½", ¾". 150 lbs. working pressure. Maximum length 50'.

VIM AIR

For general industrial use, on compressors and pneumatic tools. Black tube resists oil and heat. Husky cotton yarn braids. Smooth, red cover resists weather, abrasion. 8 sizes stocked, ¼" 2-braid to 1" 3-braid. Working pressures 150 to 225 lbs. Maximum length 500'.

BULL DOG VARI-PURPOSE AIR

For a variety of jobs including handling of air, water, oil, gasoline, kerosene (not for paints, lacquers, lacquer-solvents). Black, synthetic tube resists oil and heat. Carcass is braided rayon cord, high strength, super flexible. Smooth, brown, tough synthetic cover resists oil, abrasion, sunlight. 11 sizes stocked from 3/16" one-braid to 1" 2-braid. Working pressures: 200 to 300 lbs. Maximum length approximately 500'.

BWH
DEPENDABLE RUGGEDNESS

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

NOW!—

ONLY 1 SET OF BATTERIES

FOR TWO-SHIFT SHUTTLE CAR OPERATION!

This is no dream—it's been done! With the newest type battery-powered shuttle cars, equipped with elevating discharge conveyors and hydraulic controls, you need only one set of batteries—and they can be left in the car and never removed until replacement!

How's it done? With new 420-ampere-hour batteries and a booster charging method that replenishes expended amperage while the car is discharging at main haulage. Now, batteries can run two full shifts.

This is only one of many reasons why the swing is to battery power for fast, efficient, economical underground haulage. Many others are found in the published results of 93 coal mine studies made in mines from Pennsylvania to Illinois.

A full report on these 93 coal studies is now available in a free booklet that's yours on request. Write for your copy of "A Report of Mine Shuttle Car Operations Based on 93 Published Time Studies." Address Dept. M-10.

"Mechanics of Underground Handling and Haulage Systems, Mathewson, 1947.

Battery-powered shuttle cars have the following advantages demonstrated and proved:

SAFETY
Only battery cars are "permissible"

PRODUCTION
Can produce 10% more tonnage
Deliver more tons per man shift
Give 22% more ton-miles per shuttle car hour

PERFORMANCE
Include all design advances
Travel 25% faster
Discharge 30% faster
Are more dependable and predictable
Handle supplies easier
Reduce shuttle car change time
Can gob underground
Promote section efficiency

COST
Equal capital cost
Produce coal in shuttle car sections for approximately ½c less per ton** —in hand-loaded sections, as much as 75c a ton

**Shuttle Car Haulage, AIME, Technical Publication No. 2198.

A "MUST" FOR CONTINUOUS MINING MACHINES

Battery-powered shuttle cars enable continuous mining machines to work 10% more of the shift.

AND . . .

Two-shift operation is now possible with only one set of batteries.

GOULD

STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC.

The Gould "Duty" with "D" Heavy Duty Plate ever— America's Finest Mining Battery

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Vistac Oil

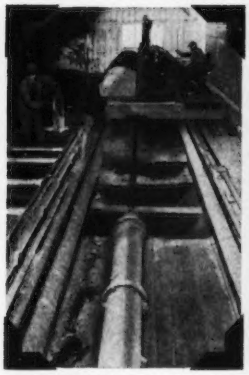
UNIT Bearings + air cylinders

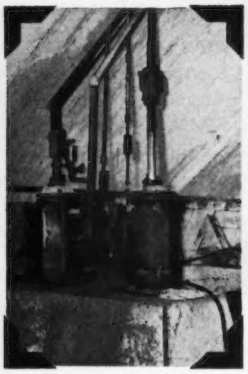
LUBRICATOR Mechanical-line feed

PERIOD 2½ years

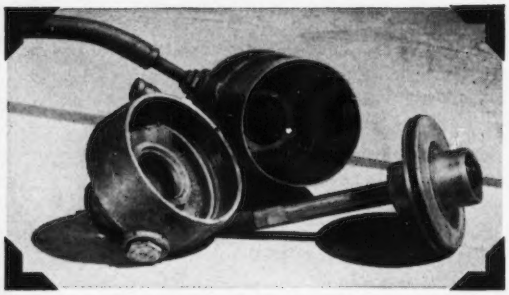
FIRM Mt. June Forest Products Co., Springfield, Oregon

Bearing- and air-power-cylinder trouble stopped by tacky oil!

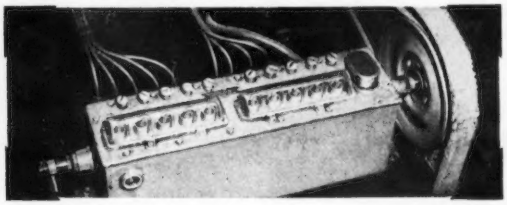




CALOL VISTAC OIL, lubricating the air "shotgun feed" and jacks (above) and all heavy-duty plain bearings in the Mt. June Forest Products Company sawmill, prevented any production delays due to lubrication in this mill's 2½ years of operation. "Using another brand under similar conditions at another mill I was constantly losing resaw bearings," says Ed Glaspey, Foreman.

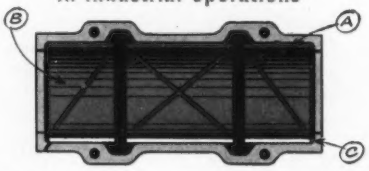


THIS AIR CYLINDER AND PISTON, lubricated by Calol Vistac Oil, was in constant use in the mill for more than a year. Note the excellent condition of the cylinder walls and the neoprene seal on the piston.



A FORCE-FEED OILER supplied lubricant through lines to air units and bearings. Calol Vistac Oil may also be applied by drip-feed oilers and lighter grades by wick-feed and ring-oilers. It comes in grades to meet operating conditions in many industries.

How CALOL VISTAC Oil cuts costs in industrial operations



Has wide use range in heavy-duty plain bearings operating in hard service, reduction gears, motor gear-heads, air cylinders, etc.; excellent air-tool lubricant—atomizes quickly and stays fluid at low temperatures.

A. Additives help form oily, pressure-resistant film...sticks on slow-moving parts and resists high temperatures.

B. Economical—small quantity will lubricate efficiently, dissipate heat.

C. Tenacious film cuts power loss and wear.

FREE CATALOG: "How to Save Money on Industrial, Marine, Railroad Equipment Operations," a new booklet full of valuable information, is ready for you. Write or ask for your free copy today.

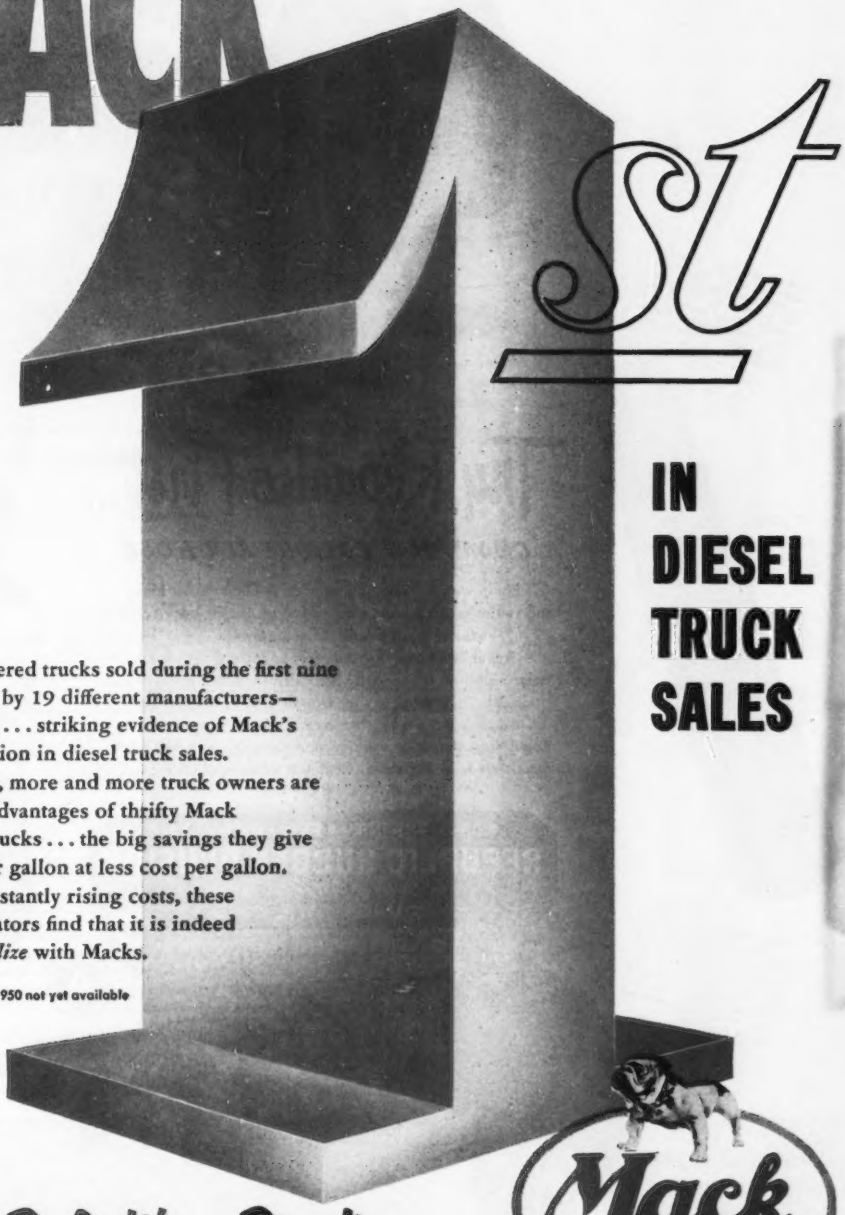
CALOL

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "CALOL" REG. U.S. PAT. OFF

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Barber, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

MACK



1st IN DIESEL TRUCK SALES

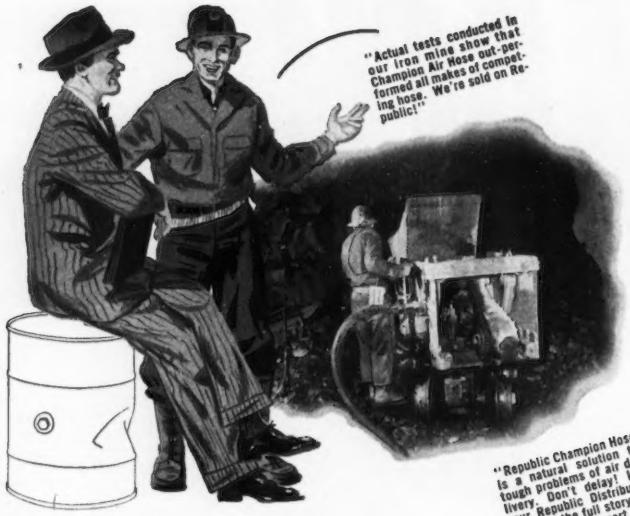
Of all diesel-powered trucks sold during the first nine months of 1950* by 19 different manufacturers—41% were Macks . . . striking evidence of Mack's top-ranking position in diesel truck sales.
The country over, more and more truck owners are discovering the advantages of thrifty Mack diesel-powered trucks . . . the big savings they give in more miles per gallon at less cost per gallon.
In the face of constantly rising costs, these progressive operators find that it is indeed *profit-wise to dieselize* with Macks.

*Final figures for 1950 not yet available

Be Profit-Wise... Dieselize with Mack TRUCKS

outlast them all

Mack Trucks, Empire State Building, New York 1, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; Long Island City, N. Y. Factory branches and distributers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.


"Actual tests conducted in our iron mine show that Champion Air Hose out-performed all makes of competing hose. We're sold on Republic!"

An oil-resistant Neoprene tube, a rubber-insulated, premium high-tensile braided carcass and a resilient yellow safety cover make Champion Air Hose the toughest product of its class anywhere in the world.

"Republic Champion Hose is a natural solution to tough problems of air delivery. Don't delay! Let your Republic Distributor give you the full story today. His free, expert recommendations save you money."

Try Republic First...

CHAMPION CALIBRE AIR HOSE

Equip with Republic's Champion All-Service Air Hose and you're set for a good long period of trouble-free operation. *And that goes for any job no matter how tough!*

Republic's Champion Air Hose is colored yellow for safer visibility. It's specially fabricated for added strength and flexibility without any increase in over-all hose weight.

Champion Hose is another great achievement produced by Republic, *specialists in industrial rubber products for a half century.*

Contact your local Republic Distributor or write direct for full facts.

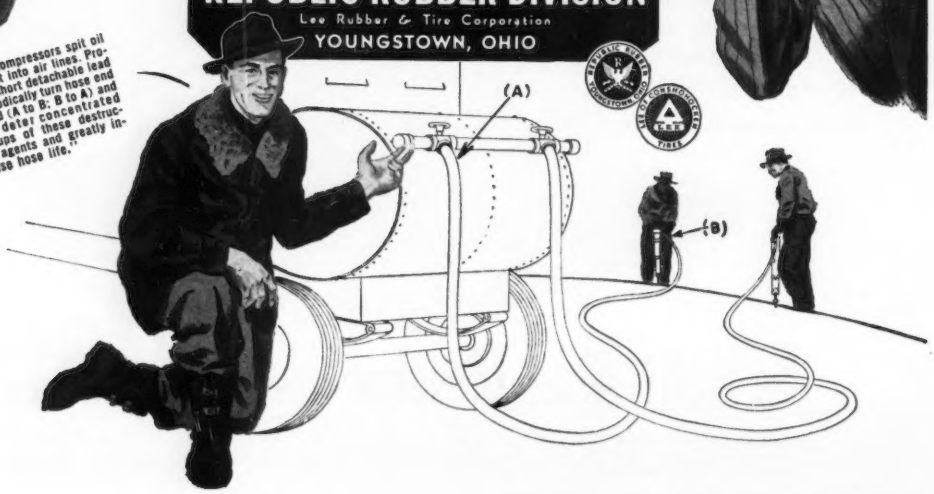
INDUSTRIAL RUBBER PRODUCTS BY

REPUBLIC RUBBER DIVISION

Lee Rubber & Tire Corporation

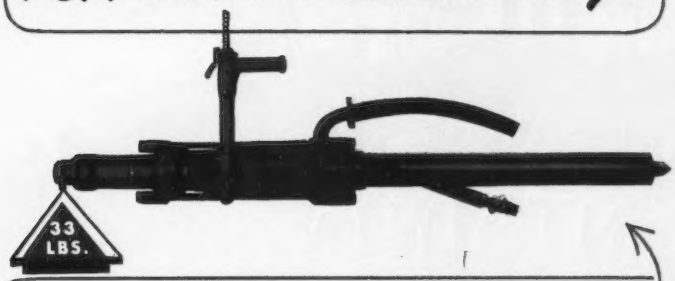
YOUNGSTOWN, OHIO

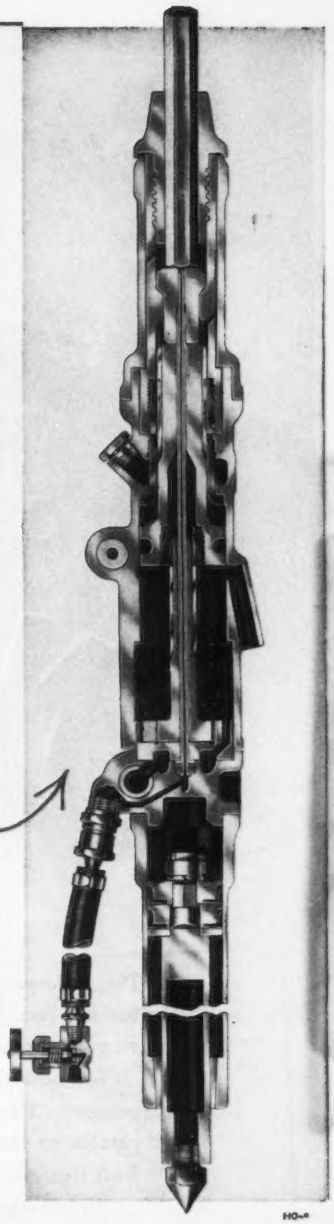
"Most compressors spit oil and heat into air lines. Provide a short detachable lead or periodically turn hose end for end (A to B; B to A) and you'll deter concentrated buildups of these destructive agents and greatly increase hose life."



HERE'S PROOF THAT

Only Blue Brute Stopers Handle So Easily... Perform So Economically!





BETTER BALANCE

A Blue Brute Exclusive

If you've never realized before how much stopers differ in the vital matter of *balance*, look at the results of this simple test, made on the Blue Brute Self-Rotating WR-31 and its two leading competitors. When the three stopers were suspended by their handles, the following weights on the chucks were required to bring each chuck to horizontal:

Blue Brute	— 33 lb.
Stoper A	— 24 lb.
Stoper B	— 0 lb.

With its operating handle set well above the center of gravity, the Blue Brute WR-31 has by far the *best working balance* for easy handling. Wrestling with a top-heavy stoper slows a runner down, sends your costs up. Give him a *correctly balanced* WR-31 and he'll make up for lost time!

POSITIVE-ACTING VALVE

A Blue Brute Exclusive

Sleeve-type, with large bearing surfaces, for minimum wear over extra-long service life. The leakproof end seats improve with age, while circumferential laps keep air from reaching both ends of the piston hammer at any stage of the cycle. And the port thrown valve both ways assures positive action on the hammer on both forward and rearward strokes. Typical of Worthington leadership in rock drill design, this jet valve keeps the WR-31 drilling faster and cleaner on very little air!

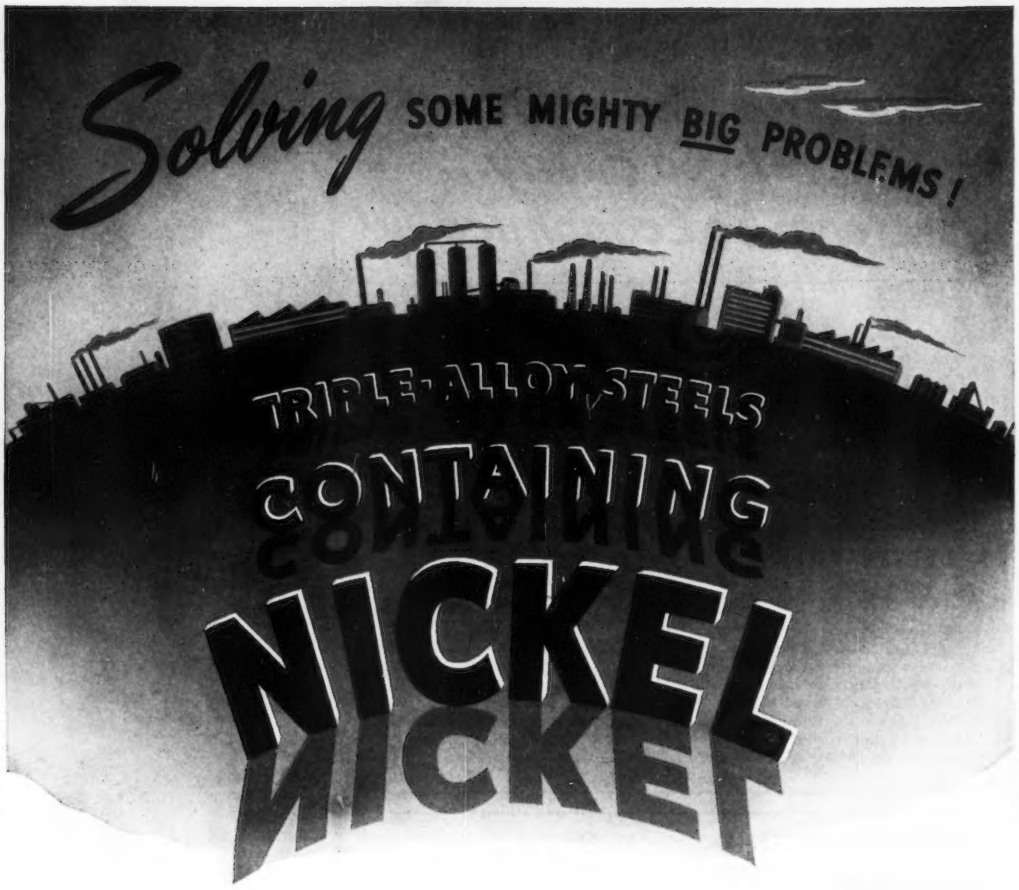
Many other WR-31 advantages . . . like the shielded, down-directed exhaust, and the constant air stream keeping sludge and water out of the shielded chuck . . . mean your runners can drill easier, faster, more profitably for you on every job. . . . Let an on-the-job demonstration prove to you that **there's more worth in a Blue Brute.** ***And write for literature describing the complete line of Blue Brute Mining Equipment.***

BUY BLUE BRUTES

Semi-Portable Compressors. Drifters with Feed Motor Incorporated. Drifters with Feed Motor on Shell. Hand-Crank Drifters. Stopers. Hand-Held Rock Drills.

WORTHINGTON

Worthington Pump and Machinery Corporation
Mining Drill Sales Division
Holyoke, Massachusetts



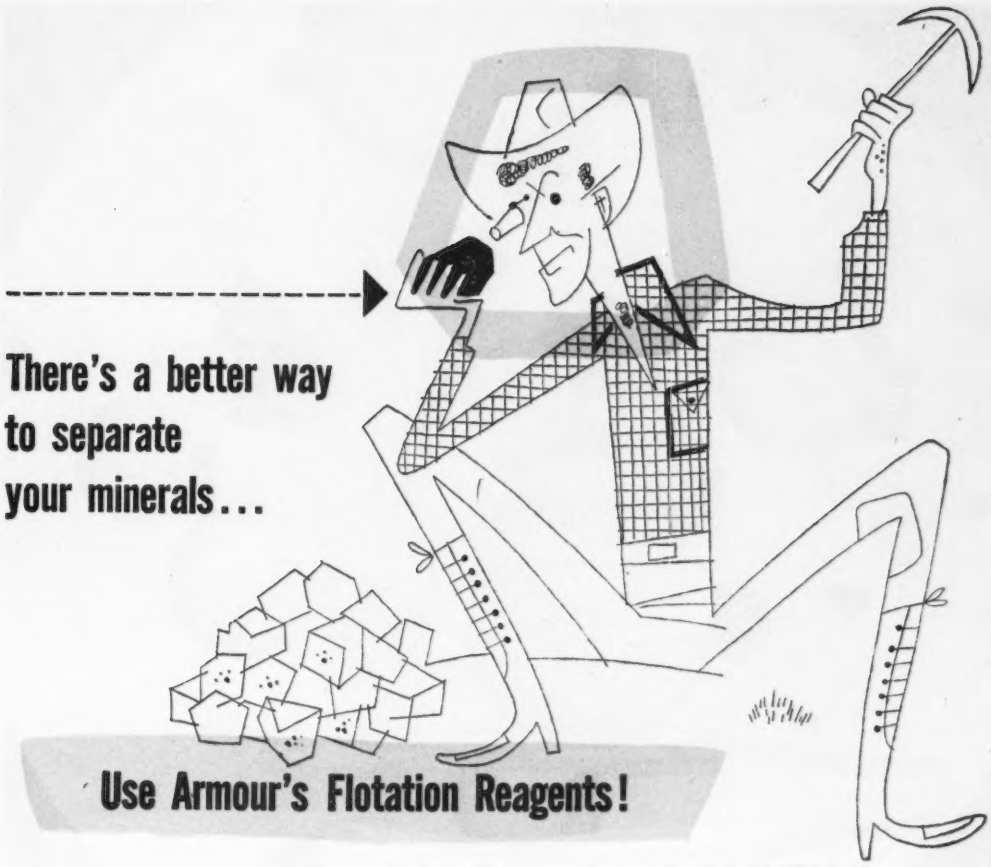
● The widespread use of triple-alloy steels containing Nickel, chromium and molybdenum is based on extensive experience in widely divergent engineering fields.

It has been found that they can be counted on for consistent performance. The depth to which full hardness is developed is comparable to that attained by other alloy steels. Their response to heat treatment is dependably uniform.

Moreover, the wide range of compositions available, makes it possible to select *accurately* suitable alloy steels for a broad range of applications.

Inquiries regarding the selection and uses of triple-alloy steels containing Nickel are invited.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.



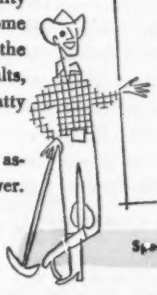
There's a better way to separate your minerals...

Use Armour's Flotation Reagents!

Froth flotation, the modern mining method, means longer life, greater productivity and more economical separations for your mine. Yields of a given ore are raised by: (1) making separations once considered economically impossible, (2) making higher grade concentrates possible, (3) recovering more than one concentrate and (4) concentrating minerals lost in tailings.

Vital to profitable flotation is the uniform high quality of the reagents. The pioneering Armour Chemical Division produces a wide range of quality chemical reagents—both anionic and cationic. In the anionic category come Armour's fractionally-distilled fatty acids. The cationic group includes the high molecular weight aliphatic amines and their water soluble amine salts, as well as quaternary ammonium salts. Armour manufactures these fatty acids and fatty acid derivatives under the strictest chemical control.

If you have a separation problem involving the listed ores and their associated minerals, Armour's technical service staff may provide the answer. Write today for more information.



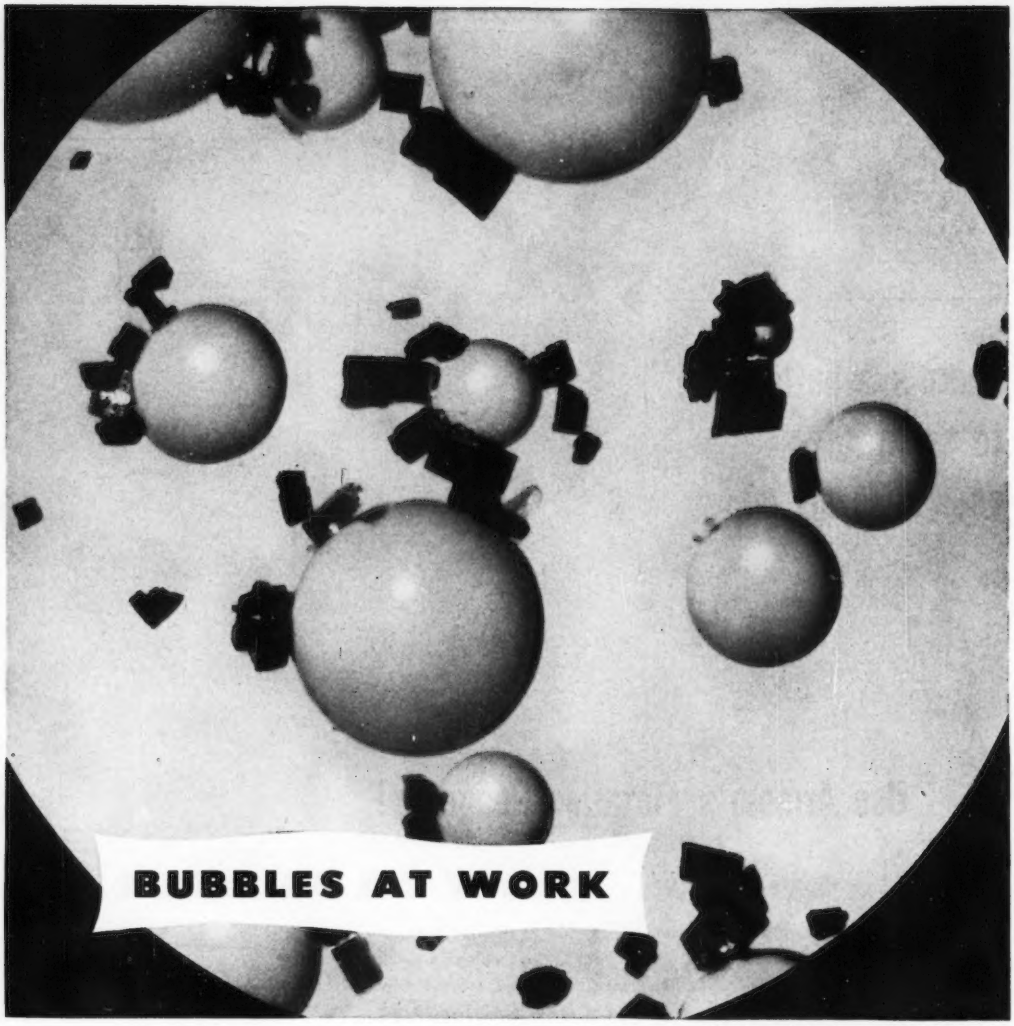
PROVEN SEPARATIONS

Amblygonite • Barite • Beryl
Cement Rock • Chromite
Feldspar • Fluorspar
Hematite and Magnetite
Ilmenite • Kaolinite • Mica
Phosphate • Potash • Salt
Silica • Spodumene
Syenite • Talc • Tin
Vermiculite

Specialists in Flotation Chemicals

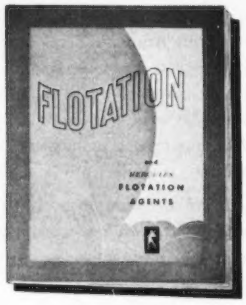
ARMOUR *Chemical Division*

Armour and Company • 1355 W. 35th Street • Chicago 9, Illinois



Photomicrograph, greatly enlarged, by H. Rush Spedden

To help step-up flotation recoveries at low cost, Hercules has developed a number of frothers and collectors. Yarmor® F Pine Oil has been a standard of quality among pine oil frothers since the early 1920's. RADA (Hercules' Rosin Amine D Acetate) is a siliceous mineral collector that has good solubility and is easy to handle. It is used in the commercial flotation of several nonmetallic ores. These and other Hercules products are described in a 16-page technical booklet, "Flotation and Hercules Flotation Agents." This booklet also contains many formulas useful in the operation and control of modern ore-dressing mills. *Send for your copy.*

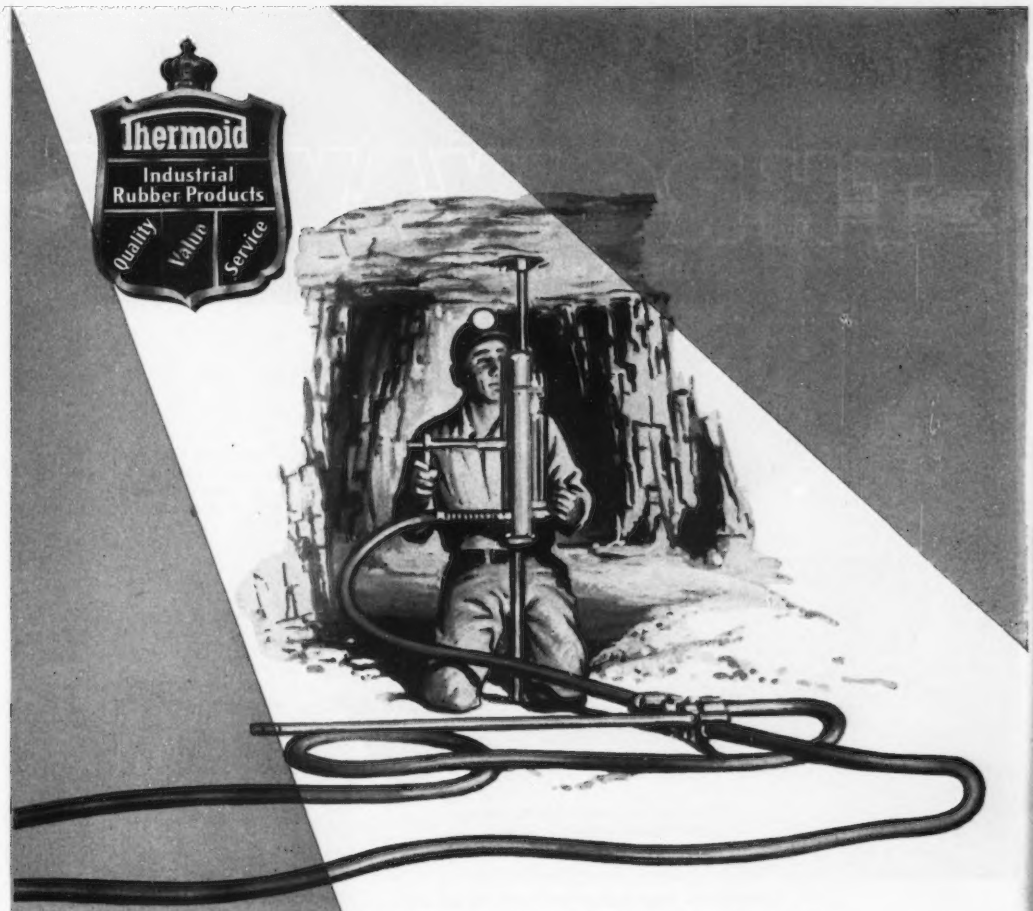


HERCULES POWDER COMPANY 933 King St., Wilmington, Delaware

HERCULES Flotation Agents

NM51-1

Thermoid
Industrial Rubber Products
Quality Value Service



Hose built for the job! That's the reason for Thermoid's excellent reputation among users of hose.

Our customers know they can rely on Thermoid's recommendations for their requirements . . . whether it's for air, water, suction, sand and concrete discharge, dredging sleeves, jetting hose—or any of the many other types of Thermoid hose built for the mining and construction industries.

And men who buy these quality products like the service they get from Thermoid's experienced distributors and sales representatives—and their intimate knowledge of the *buyer's* problems.

Get the hose built for *your* job. Specify Thermoid.

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

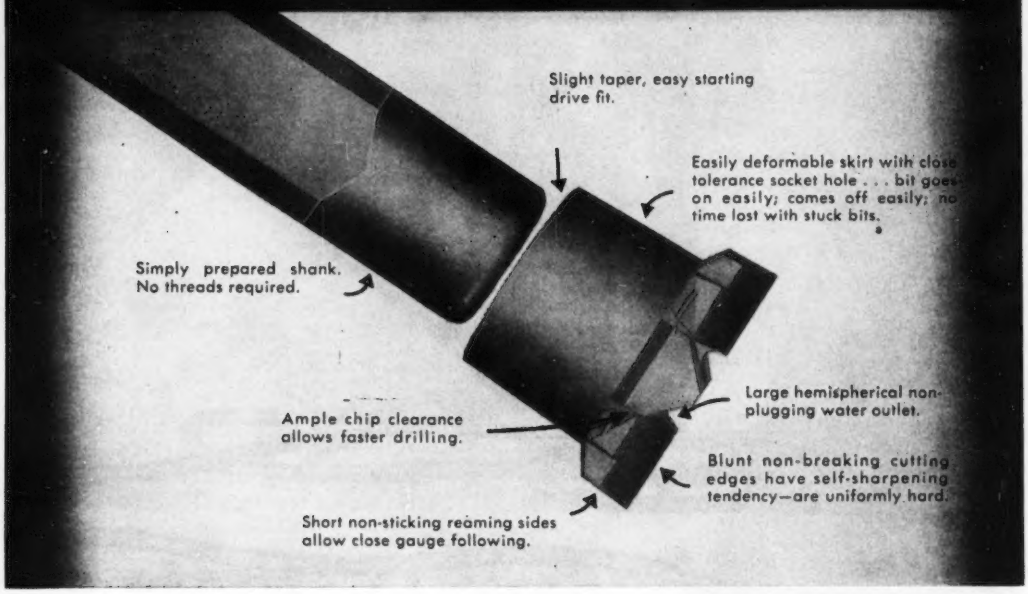
Thermoid

Rubber Sheet Packings • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

THROWAWAY

DETACHABLE ROCK BITS


Slight taper, easy starting drive fit.
Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no time lost with stuck bits.
Simply prepared shank. No threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency—are uniformly hard.
Short non-sticking reaming sides allow close gauge following.

The Throwaway 1¼" Socket Steel Bit

Suitable for Wagon Drills

These Throwaway steel bits will take a beating, and will cut rock fast. They have a large chip clearance and will give many feet of economical drilling.

Made in all sizes from 2½" to 2" with ⅛" gauge changes.

The Throwaway Standard 1" Socket Steel Bit

Suitable for Wagon Drills, Drifters, Jackhammers, and Stopers

This is the old favorite which has been used for economical drilling all over the world. Used on any type or size of steel, machined, ground or forged to fit its 1" socket.

Sizes from 2 1/4" to 1 9/16" with 1/16" gauge changes.

The Throwaway 7/8" Socket Steel Bit

Suitable for Jackhammers and Stopers

These bits were primarily designed for roof suspension bolt holes and general use, with ⅞" hexagon or quarter-octagon steel.

Sizes 1⅝" to 1¼" with 1/16" gauge changes.

Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

Some territories still open for distributors and jobbers.

THROWAWAY BIT CORPORATION

4200 N.W. Yeon Ave. Portland, Oregon, U. S. A.

OUT AHEAD

with GM DIESEL POWER!

HD-20—41,800 lbs. of properly balanced weight; long, wide sure-gripping tracks and the new GM 6-110 Diesel engine driving through hydraulic torque converter give the Allis-Chalmers HD-20 brute strength to take toughest jobs in stride.

HD-15—27,500 lbs.—102 Drawbar H.P.—powered by a 6-cylinder GM Series 71 Diesel engine.

HD-9—18,500 lbs.—70 Drawbar H.P.—powered by a 4-cylinder GM Series 71 Diesel engine.

General Motors 2-cycle Diesel engines supply the hard-hitting power that enables Allis-Chalmers' great new line of tractors to outwork all others.

Four and six-cylinder GM Series 71 engines driving the HD-9 and HD-15—and the powerful new GM 6-110 engine driving the HD-20—give these new tractors a reserve of smooth, dependable power for easy handling, increased work and minimum maintenance.

The greater efficiency of 2-cycle operation and direct fuel injection simplifies design and enables these engines to produce far more horsepower than other Diesels of equal size and weight. Interchangeability of Series 71 engine parts provides maximum availability—keeps them on the job.

That's why GM Diesel engines are chosen to power not only the "World's most modern line of crawler tractors"—but more than 500 different kinds of machinery built by 120 manufacturers.

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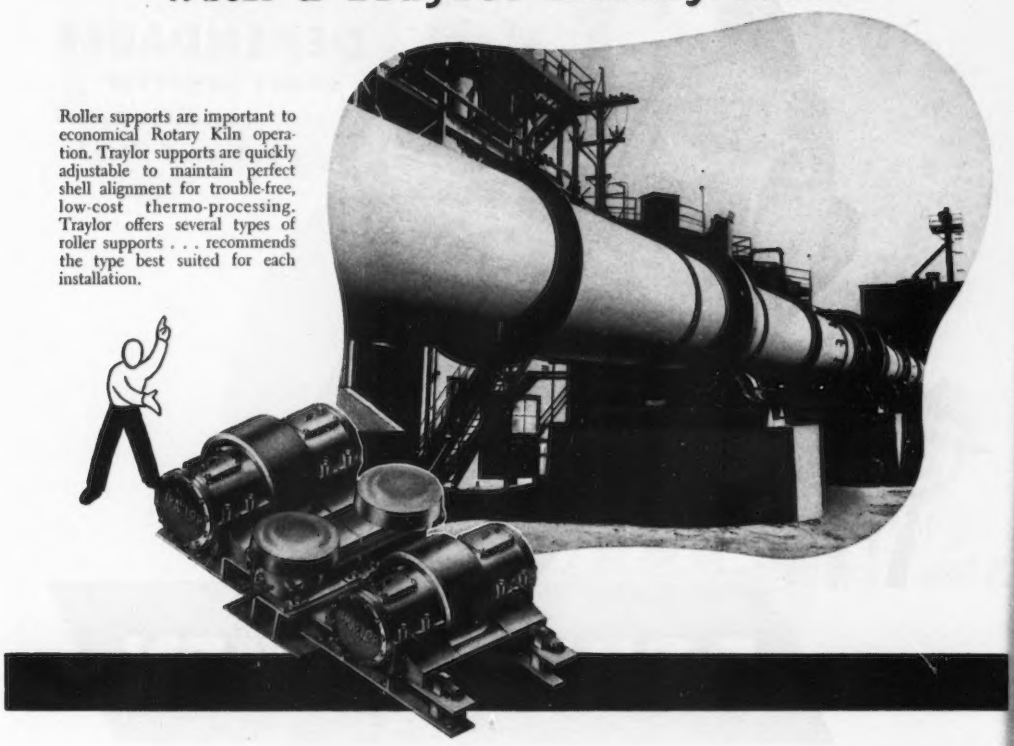
means lower thermo-processing costs with a Traylor Rotary Kiln

Roller supports are important to economical Rotary Kiln operation. Traylor supports are quickly adjustable to maintain perfect shell alignment for trouble-free, low-cost thermo-processing. Traylor offers several types of roller supports . . . recommends the type best suited for each installation.



Everything . . . *even the most minor detail* . . . is carefully considered before Traylor builds a Rotary Kiln. 40 years of experience has demonstrated to Traylor that the smallest details . . . as well as the more obvious factors . . . play an important part in every efficient Rotary Kiln installation. Place your thermo-processing problem in Traylor's hands where *"everything considered"* means lower costs for you.

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Big Bruisers for Busting Rock!

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Denver Crushed Stone Co., Inc. of Golden, Colorado, gets top tonnage from two Lorains, an "820" foreground and an "80" in background. For facts on all Lorains from ½-yard and up, get Lorain Condensed Catalog from your Thew-Lorain Distributor—or write to

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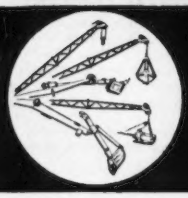

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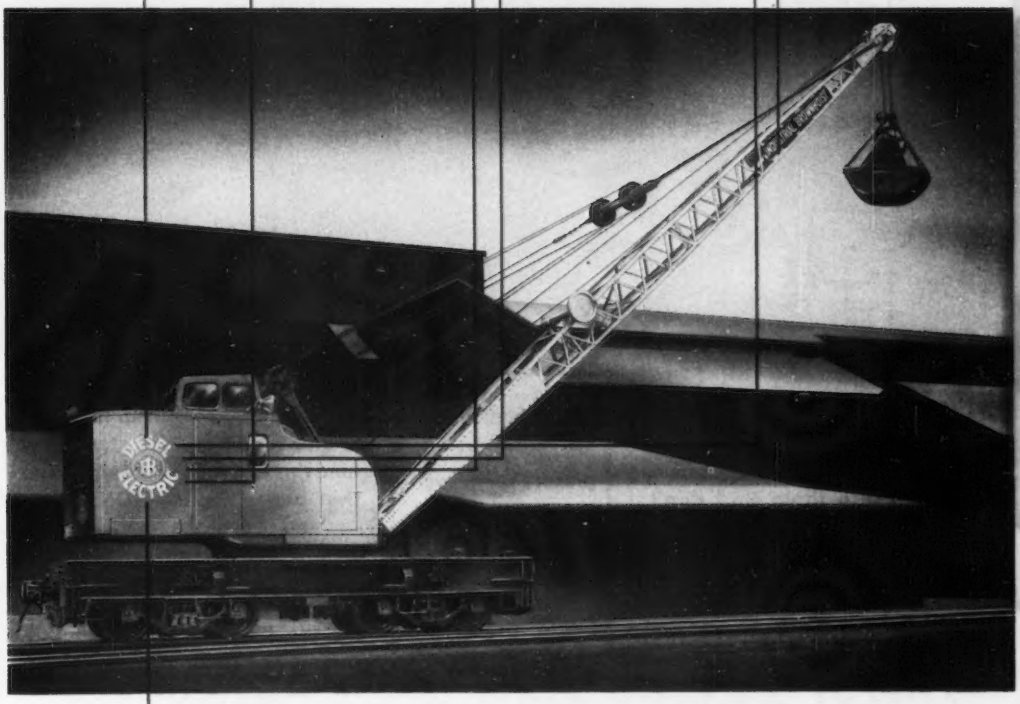

BROWNHOIST

and these optional features—8 wheel chain drive for increased drawbar pull. Twin engine drive for work on extreme grades or where greater tractive effort is required. Timken roller bearing journals for low starting tractive effort. For complete description write to . . .

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installed on swing jaw and front head to double the life of jaw plates and cut maintenance costs in half.

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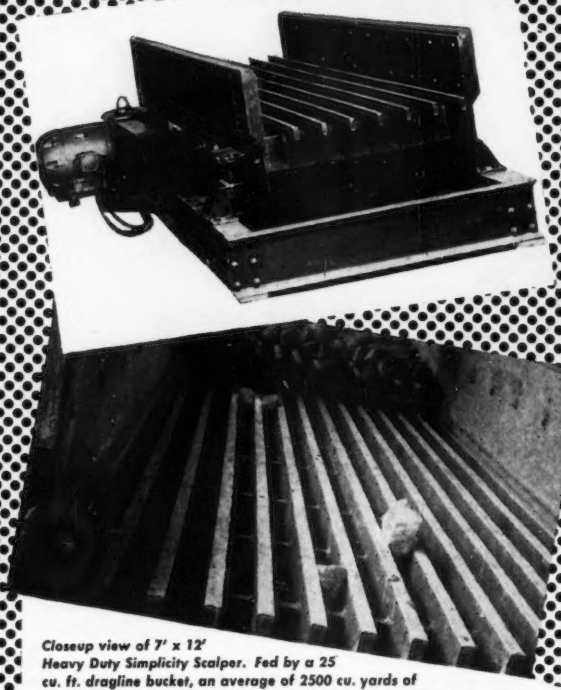

Closeup view of 7' x 12' Heavy Duty Simplicity Scalper. Fed by a 25 cu. ft. dragline bucket, an average of 2500 cu. yards of material passes through the 5" opening between the riding rails each hour. Approximately 250 cubic yards of boulders are scalped off the top.

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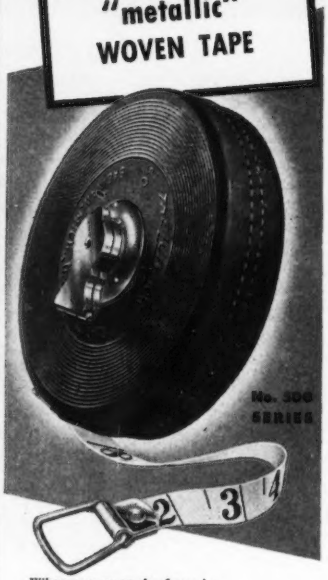

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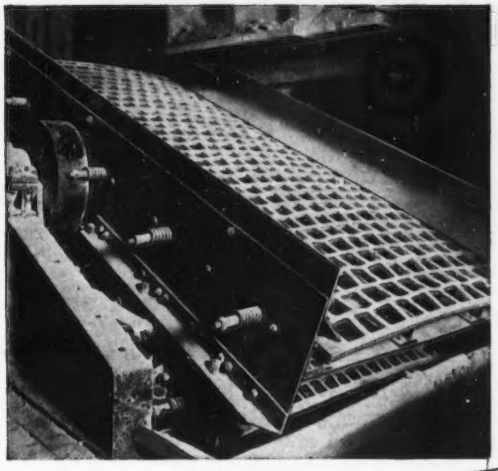

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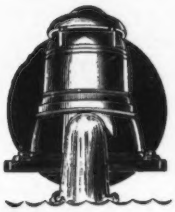

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If your construction program is being delayed because of deliveries running into months, get in touch with our plant where a part of our foundry and machine shop capacity has been set aside for giving you weeks delivery instead of months.

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High Efficiency! Maximum Performance!
NEW
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These welders combine the advantages of both the A.C. transformer type welders and the D.C. motor-generator type without any of their inherent disadvantages . . . they offer you the highest efficiency and maximum performance . . . they require a minimum of maintenance.

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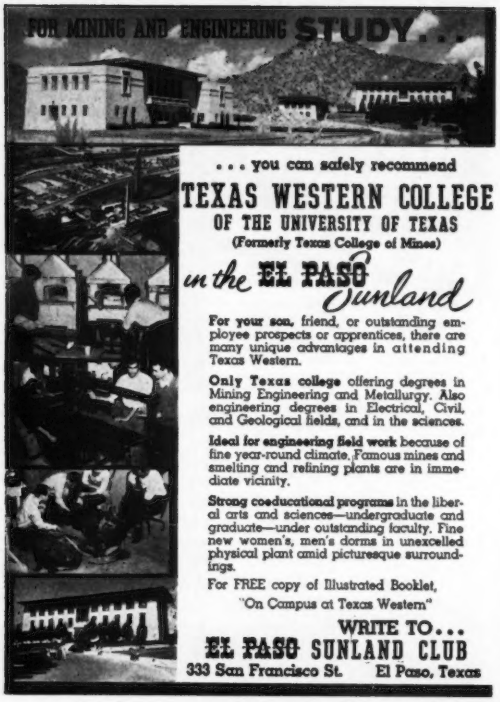

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NEW ADVERTISEMENTS received by 10 A.M. March 15th at the New York Office, 330 W. 42nd St., N. Y., will appear in the April issue subject to the limitations of space available.

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A mature graduate metallurgical engineer with 10-15 years experience in the design and operation of ore dressing and hydrometallurgical plants for position in our rapidly expanding Consulting Engineering Department in Stamford, Connecticut, presently engaged in critically-needed defense work. Experience in smelting and roasting also desirable, but not essential.

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P7942, Engineering & Mining Journal
330 West 42nd St., New York 18

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P8623, Engineering & Mining Journal
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MINING ENGINEER with extensive experience in mining and milling critical ores for inspection, evaluation and development of deposits. Headquarters in New York. State full details including experience, references and salary desired. P 8961, Engineering & Mining Jl.

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CHEMIST ANALYTICAL, metals minerals expert assayer, 15 years experience in commercial laboratory seeks new connection. PW 8903, Engineering & Mining Jl.

GRADUATE MSc. age 38—Canadian—Wide experience in non-ferrous metallurgical development and 12 years as plant superintendent; desires position with consulting firm or senior position in metallurgical or chemical plant. PW 9007, Engineering & Mining Jl.

MINING ENGR., age 45 married, 6 yrs. mining surface and underground, balance misc. civil, highways, etc. Last 6 yrs. geodetic and control surveys, present employed, salary $4500. Want responsible position, present salary or better, in charge of surveys, maps, sampling, etc. surface operations, permanent nature. Available one or two months after acceptance. PW 9100, Engineering & Mining Jl.

Mining company, located in Washington, D.C. will represent a few western mining groups or individuals in negotiations with the D.M.A., or other agencies. Only compensation required is an exchange of non-assessable stock. We have a fine record of performance, but no irregular "inside" contacts.

RA 9045, Engineering & Mining Journal
330 W. 42 St., New York 18, N. Y.

ANACONDA COPPER MINING CO.
25 Broadway
New York 4, N. Y., February 15, 1951.
DIVIDEND NO. 171
The Board of Directors of Anaconda Copper Mining Company has declared a dividend of Seventy-five Cents (75c) per share on its capital stock of the par value of $50 per share, payable March 29, 1951, to stockholders of record at the close of business on March 6, 1951.
C. EARLE MORAN, Secretary & Treasurer.

OPEN PIT MINING

Contractor with excellent equipment and experienced personnel interested in excavating, material handling, or open pit mining work.

CW1319—Engineering & Mining Journal
330 W. 42nd St., New York 18, N. Y.

WANTED

Large engineering firm wishes to acquire several complete plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment whole or in part. Personnel retained where possible, strictest confidence.
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Wanted for immediate use new or used,

PAN AMERICAN JIGS

42"x42" cells—balanced placer type preferred. Address reply to T. C. King, Resident Engineer, Rhude & Fryberger, 443 East 14th, Baxter Springs, Kansas.

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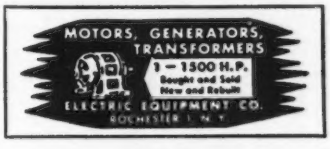

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Geologist and prospector

with knowledge of the mineralized belt of Canada from Yukon to Labrador, Quebec and Newfoundland, looking for $10,000 for the season. The state Crown land either on pitchblende or base metal also gold with knowledge of good property could be optioned right across the belt on base metal and gold. Mining people only reply who are very much esquire. This ad is put in by a pioneer of uranium find in early part of '46 in Athabaska Lake north of Saskatchewan. BO 8965, Engineering & Mining Jl.

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Consult: A. H. Polachek.

Reg. Patent Attorney, 1234 Broadway, New York 1, N. Y.

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Seven full claims (unpatented), all mineralized, ore body opened up on 300-ft. level, low grade, measures over 100 ft., great possibilities of developing commercial ore below 300-ft. level. Surface might be profitably worked for gold with power shovel. Several shafts, a number of open cuts, and trenches. Main shaft 300-ft. vertical depth, timbered and lagged. No equipment. No. water.

Good desert road to property.

No adverse claims; no debts; or other liabilities.

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130 South Virginia St.
Reno, Nevada

Double Drum mine hoists—300 hp, 150 hp, 100 hp, 75 hp, 55 hp.
Single drum hoists—100 hp, 75 hp, 52 hp.
Rolls—42" x 16" Traylor.
Compressors—2000, 1250, 750, 500, 350, c.f.m.
Diesel Generators—75 KW, 440 volt, 1200 r.p.m. Hercules.
Ball Mills—6 x 12, 7 x 6 Allis Chalmers, 5 x 4 Hendy, 3 x 2 Marcy.
Transformers—3 each. 100 KVA, 50 KVA, 25 KVA. 2400—220/440.
Motor—100 hp, 435 r.p.m., 2200 volt slip ring.
Locomotive batteries—12 Exide 60 cell units TLM-27 Ironclad with steel boxes.

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1—4′ 6-disc Eimco, with Vac. Equip. With new Sectors and Bags.

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2—#6 Wilfleys, with rubber deck covering
4—6′ x 16′ Deister Type

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3—37½KVA Pittsburgh 440-110/220 v.
2—5KVA Wagner 2200-220-1100/110
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2—#24, 8-cell Denver "Sub-A"-43″ x 43″ cells—wood tanks, complete with motors and new rubber impellers

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1—#21½ Vulcan Sgl. Drum, with U-6 Gas Power Unit. Condition like new
1—50 HP #50-NNN I.R. 3-drum Slusher with new 1½ Yd. Crescent Scraper. Hoist used 3 months
1—15 HP Box I. Wks. Sgl. Drum with 15 HP Slip-ring Motor. Like new.

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1—8 x 10 Blake Crusher
1—10″ x 4′6″ Long Screw Feeder - Motorized
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1—3′ x 3′ Ball Mill
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6—2″ Wilfley Sand Pumps
3—Galigher Auto. Samplers
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3—16 cu. ft. Ore Cars - 18″ ga.
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1000 KW to 100 KW
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6—20 ton Plymouth Gasoline Engine Locomotives, type 2-HL, 36″ gauge, with LeRoi 6-cylinder Model RXIS engines. These locomotives were manufactured by the Fate-Root-Heath Company of Plymouth, Ohio. The overall dimensions of these locomotives are as follows: Length 18′10″, Width 9′0″, Wheelbase 5′11½″.

45—15 ton Sanford Day automatic drop-bottom coal cars with multiple latch, arch bar trucks, having four 18″ wheels under each end, and the gauge is 36″. The trucks are Sanford-Day Roller Bearing. About an equal portion of these cars are 2-door dump and the balance are 3-door dump. The overall dimensions are as follows: Length of bumpers 25′2″, Length inside 20′11½″, Width 6′10¾″, Height 6′6″. The width of the dump door is 2′9″.

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CANTON, ILLINOIS
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7—60x84″, 40x48″, 36x42″, 24x36″ & 28x36″.
ROTARY DRYERS & KILNS
4′x20′, 4′x30′, 4½′x40′, 5′x50′, 6′x35′, 80″x45′, 80″x60′, 90″x80′, 94″x70′, & 104″x85′, Single and Double Shell.
Kilns, 4½′x30′, 6′x60′, 4′x40′ & 9′x170′.
150 HP. G.E. Type I Motor. 3-66-2200, 350 R.P.M.
BALL, ROD & TUBE MILLS & CLASSIFIERS
5′x22″, 6′x22″, 6′x48″, 8′x22″ & 8′x36″ Hardinge Conical Ball Mills.
4x4, 6x6 & 7x5 Cylindrical Ball Mills.
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36″ & 78″ Spiral and 4′ Dorr Rake Classifier.
4x10, 5x12, 7x16 Rod Mills. Marcy, Hardinge.
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40—10,000 Gal. R. R. Car Tanks.
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6′x48″ Hardinge Mill with Air Classifying.
#0 & #1 Raymond Automatic Pulverizers.
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INDUSTRIAL RUBBER PRODUCTS FOR EVERY PURPOSE
IMMEDIATE DELIVERY OF CONVEYOR, ELEVATOR AND TRANSMISSION BELTING — FIRE, WATER, SUCTION, AIR, STEAM AND WELL HOSE

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RUBBER CONVEYOR BELTING

TOUGH COVERS—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.
STRONG CARCASS—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.
FLEXIBILITY — Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following desirable features: troughs easily, runs true on all idlers, gouge resistant, excellent for long and short hauls and slope installations.

Avoid delays in your production schedules!

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches.

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8″	4	1/16″	1/32″	28 Oz.
10″	4	1/16″	1/32″	28 Oz.
12″	4	1/16″	1/32″	28 Oz.
14″	4	1/16″	1/32″	28 Oz.
16″	4	1/8″	1/32″	28 Oz.
18″	4	1/8″	1/32″	28 Oz.
20″	4	1/8″	1/32″	28 Oz.
20″	5	1/8″	1/32″	28 Oz.
24″	4	1/8″	1/32″	28 Oz.
24″	5	1/8″	1/32″	28 Oz.
26″	5	1/8″	1/32″	28 Oz.
30″	4	1/8″	1/16″	32 Oz.
30″	5	1/8″	1/16″	32 Oz.
30″	6	1/8″	1/16″	32 Oz.
36″	6	1/8″	1/16″	32 Oz.
42″	5	1/8″	1/16″	32 Oz.
48″	8	1/8″	1/16″	32 Oz.

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ELEVATOR TRANSMISSION & V-BELTING ALSO IN STOCK.

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Sturtevant Rotary fine crushers—No. 0—No. 1—No. 1½ and No. 2
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One 4 roll Raymond Mill, low side.
8′ x 10′—8′ x 12′—11½′ x 19′ Rotary Filters.

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1—5 HP Gen. Elect. 3/60/220, 100 RPM.
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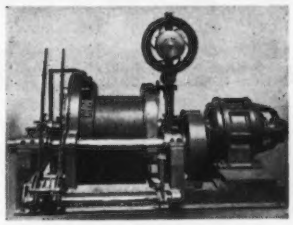
1—15 HP West., 3/60/440, 1200 RPM.
1—20 HP Gen. Elect. 3/60/440, 720 RPM.
3—20 HP Gen. Eleet., 3/60/440, 1200 RPM.
1—30 HP Gen. Elect., 3/60/440, 1755 RPM.
1—40 HP West., 3/60/440, 860 RPM.
1—50 HP Gen. Elect., 3/60/440, 850 RPM.
1—50 HP West., 3/60/440, 1180 RPM.
1—52 HP Gen. Elect., 3/60/440, 550 RPM.
2—52 HP Gen. Elect., 3/60/220, 860 RPM.
1—75 HP Gen. Elect., 3/60/440, 430 RPM.
1—75 HP West., 3/60/440, 885 RPM.
1—82 HP Gen. Elect., 3/60/440, 495 RPM.
1—100 HP Gen. Elect., 3/60/440, 720 RPM.
2—165 HP Gen. Elect., 3/60/440, 450 RPM.
1—200 HP West., 3/60/440, 580 RPM.
1—200 HP Gen. Elect., 3/60/220-440, 435 RPM.
1—20 HP Allis-Chalmers, 3/60/2200, 860 RPM.
2—30 HP Gen. Elect., 3/60/2200, 900 RPM.

LOCOMOTIVES

1—1½ ton Mancha "Little Trammer" battery, 18"-24" gauge.
3—2½ ton Mancha battery, 18"-24" gauge.
1—2½ ton Whitcomb battery, 24" gauge.
2—3 ton West. battery, 24"-36" gauge.
3—7 ton Gen. Elect. battery, 36" gauge, permissible type.
3—8 ton Gen. Elect. battery, 36" gauge.
4—10 ton Atlas battery, 36" gauge.
1—6 ton Goodman trolley, 36" gauge.
2—6½ ton Gen. Elect. trolley, 36" gauge.
1—5" x 10" Porter compressed air.
1—5½" x 10" Baldwin compressed air.
1—3 ton Ruth. gas engine driven.
2—18 ton Davenport steam locomotives.

THICKENERS

1—Morse #2 low head thickener mechanism and superstructure for 16' x 8' tank.
1—Dorr 3 tray, 4 compartment thickener, steel tank 40' diameter x 30' high.



ELECTRIC HOISTS

1—#0 Vulcan 11 HP single drum.
1—#1½ Vulcan 22 HP double drum.
1—#22-C Vulcan 35 HP single drum.
2—#4½ Vulcan 52 HP single drum.
1—#23-ELF Vulcan 80 HP single drum.
1—150 HP single drum hoist.
1—60-100 HP Vulcan single drum.
1—125-165 HP Vulcan single drum.
1—125-165 HP Vulcan double drum.
1—Lidgerwood 3-drum 80 HP contractor's type.

BALL AND ROD MILLS

1—30" x 24" new Morse batch mill.
1—4' x 4' standard ball mill.
2—6' x 36" Hardinge conical ball mills.
2—#64½ Marcy ball mills.
1—5' x 5' Marcy ball mill.
2—8' x 22" Hardinge conical pebble mills.
1—3' x 6' Dowse tube mill.

COMPRESSORS

1—60 CFM 6" x 5" Worthington.
1—90 CFM 8" x 6" Gardner.
1—131 CFM 8⅛" & 4¾" x 5" Chicago-Pneumatic.
1—139 CFM 8⅝" x 4¾" x 5" Chicago-Pneumatic.
1—156 CFM 7" & 5¾" x 5" Gardner-Denver.
1—172 CFM 10½" x 4¾" x 8" Rix.
2—293 CFM 12" & 6½" x 10" Ingersoll-Rand.
1—317 CFM 7" & 5¾" x 5" Gardner-Denver.
1—382 CFM 8⅛" & 5½" x 5½" Chicago-Pneumatic.
1—447 CFM 14" & 7½" x 12" Ingersoll-Rand.
1—527 CFM 9¾" & 6" x 7" Gardner-Denver.
1—637 CFM 14" & 8¾" x 10" Sullivan.
1—800 CFM 18" & 11" x 16" Ingersoll-Rand.
1—888 CFM 19" & 12" x 16" Ingersoll-Rand.

DIAPHRAGM PUMPS

1—2" Morse Bros.
1—3" Goulds.
1—4" Dorrco.

MULTI-STAGE PUMPS

1—2" 2-Stage Ing.-Rand motor pump.
1—2" 4-Stage Hill centrifugal pump.
1—2" 6-Stage Union centrifugal pump.
4—2½" 4-Stage Penn. centrifugal pumps.
1—2½" 6-Stage Pacific centrifugal pump.
1—3" 3-Stage Hill centrifugal pump.
1—3" 4-Stage Buffalo centrifugal pump.
2—3" 5-Stage United centrifugal pumps.
4—3" 6-Stage United Centrifugal pumps.
1—4" 2-Stage Platt centrifugal pump.
1—6" 8-Stage Manistee centrifugal pump.

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1—16,000# Allis-Chalmers Sgl Drum
1—30,000# Allis-Chalmers Dbl Drum AC
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1—20,000# Amer. Hoist Carspotter AC
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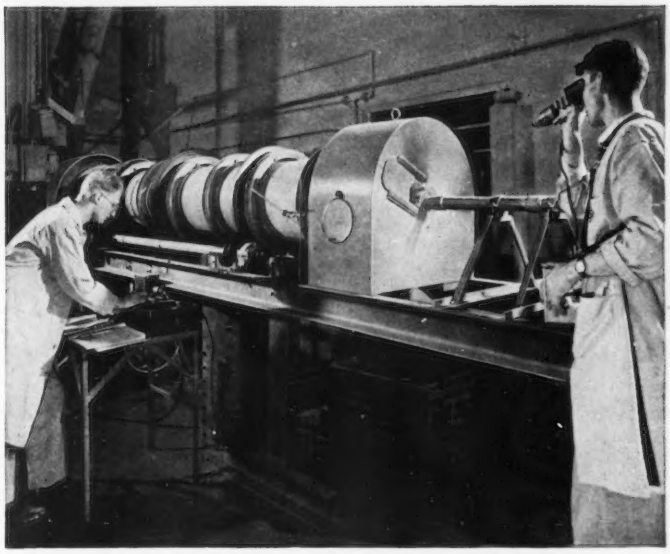

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